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20 PAGES!**

THE CHANCES OF GLOBAL DISASTER (PAGE 30)

Backwoods Home magazine

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practical ideas for self reliant living

Vehicles for a new MILLENNIUM

***What grandma used
Home-raised beef
Homemade candy
Cool cucumbers
Guns for Y2K & beyond***



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Publisher's Note

This issue is bigger, longer, fatter

This issue is 20 pages longer than usual, which makes it the fattest magazine we've ever had. About 10 of the 20 new pages are advertising, as companies are increasingly trying to tap into the economic mini-boom that the growing concern over the Y2K computer problem has created. Many of our advertisers report that their sales have doubled and tripled. China Diesel, which only a few years ago had a handful of employees, now has 60 to service the growing demand for their engines. Bob McBroom, the owner of Kansas Wind Power, told me he wants to hold off advertising for a while because he can't keep up with the orders. "The phone just rings all day and I don't even answer it anymore," he said.

Expos and shows growing

It's all pretty amazing to me. Even the Preparedness Expos, which have always been lively, are having to hire bigger halls to accommodate the huge crowds looking for self-reliance information and products. And new Y2K Expos and Readiness Shows are popping up all over the country. We're scheduled to be at shows in Philadelphia, Tampa, Detroit, Kansas City, St. Louis, Nashville, Dallas, Oklahoma City, Denver, Phoenix, San Jose, Portland, and Seattle. And we're not doing all the shows by a long shot. We've listed most of the major shows at our web site (www.backwoodshome.com), but if you intend to attend one you should contact the show organizers directly to make sure a date or a city has not changed.

Reprinted "Doom and Gloom Issue"

For the first time in our 10-year history, we have reprinted an issue—our January/February (No. 55) "Special Doom and Gloom Issue." It sold off the newsstand in four days, and we had many requests for multiple copies of the issue, up to 30, 40, and 50 copies from some people. If you want a copy, you can have one for our back issue price of \$5. Just call us toll free at 800-835-2418, or send a check to us at P.O. Box 712, Gold Beach, OR 97444.

Product reviews

This issue also has our first product review in a long time (page 57). We'll do product reviews when we can find the qualified people to do them. If you'd like to submit a product for review, call first to see if we can handle it.

Finally, a new anthology

We've finally gotten a new anthology together. It's our Sixth Year Anthology and it will sell for the same price as the others—\$16.95, which includes postage and handling. Size is the same too: 8.5 x 11 inches, 384 pages. The ad on page 14 gives some details.



*Issue no. 55 has been reprinted.
See the ad on page 93 to order.*

More "books for sale" pages

You may notice that this issue has two new pages of books for sale—pages 55 and 56. The books on page 56 are "how-to," but the books on page 55 essentially explain points of Libertarian philosophy as it pertains to important issues of our time. The key editors of this magazine, including myself, are Libertarian. The platform of the Libertarian Party is the U.S. Constitution, as written and interpreted by our Founding Fathers. These books are eye-openers and will probably give intellectual ammunition to most of the readers of this magazine, who, I believe, are Libertarians at heart.

Web site

Our Web site continues to grow. We're over a million visitors per year, based on last month's figures. The average stay per visitor is about 15 minutes, which is very high for a web site.

Cranberry ale

Austin England brought by several bottles of his home-brewed cranberry ale the other day, and it's among the best home-brew I've ever had. On a scale of 1 to 10, I'm giving it an 8, as did Jean L'Heureux. Silveira and Mark Cogan each gave it a 7. If you'd like your home brew rated, drop some by and we'll do a product review. We're very qualified here: I'm all Irish, Cogan's half, and Silveira's a drunk Portagee—Irish from his mouth to his liver. L'Heureux is a Frenchman but we let him try the beer anyway.

My view

At fascism's doorstep

Fascism and socialism are the political philosophies that hold that the state should control a country's means of producing wealth. Where socialism seizes the money-producing industries outright, fascism leaves much of the private sector intact but tightly controls it through government management. Otherwise there's barely a nickel's worth of difference between the two political systems. Germany and Italy were the prime fascist states during World War II, and communist countries like China, Cuba, and the former Soviet Union are the modern socialist states. These states always come to ruin, because state control of people's lives is an unworkable idea. It goes against human nature, and, historically, fascism and socialism have only been maintained by government force, until the enslaved and impoverished people rebel and bring down the government.

Despite fascism's and socialism's disastrous records, which includes not just the financial ruin of the countries that adopted them but a legacy of imprisonment and murder of millions of the citizens of the unfortunate countries, the appeal of these unworkable systems is still strong in many countries, including this one. If you want a bold new example, just take a look at President Clinton's proposal to *save* social security in America, and witness the response—or rather, the lack of outrage—from Democrats and Republicans in the U.S. Congress.

Under the guise of trying to *save* social security, which accounts for nearly 22% of all federal spending, President Clinton has proposed that a large portion of social security trust fund money be invested by the government into the stock market to earn a greater return for future retirees. His proposal is a bastardization of financial studies that conclude that social security recipients would be far better off if the social security system were privatized, so that participants, instead of investing money into a system that nearly everyone agrees cannot survive as presently structured, were allowed to invest their social security tax dollars into the private sector. Among the many compelling reasons cited by these studies: The private sector has earned 8% in real money over the past 75 years (including the Depression years), while the government's social security has earned 2%—not in real money but in government IOUs.

Clinton's proposal, however, would allow the government, not social security participants, to invest the money in the stock market, thus maintaining government ownership and control over the funds. Due to the large sums involved—about \$650 billion—it would give government direct management control over nearly every major American business in America, opening the door to political

pressures about how those companies do business. As has already been demonstrated by some state and county pension funds that already invest in the stock market, politics will replace sound financial management as the criterion for investment. For example, environmental companies would get lots of government investment, while tobacco companies and others who do not toe the party line would get nothing. The result would be the undermining of sound financial investment with the political-expediency of investing public money into socially desirable businesses.

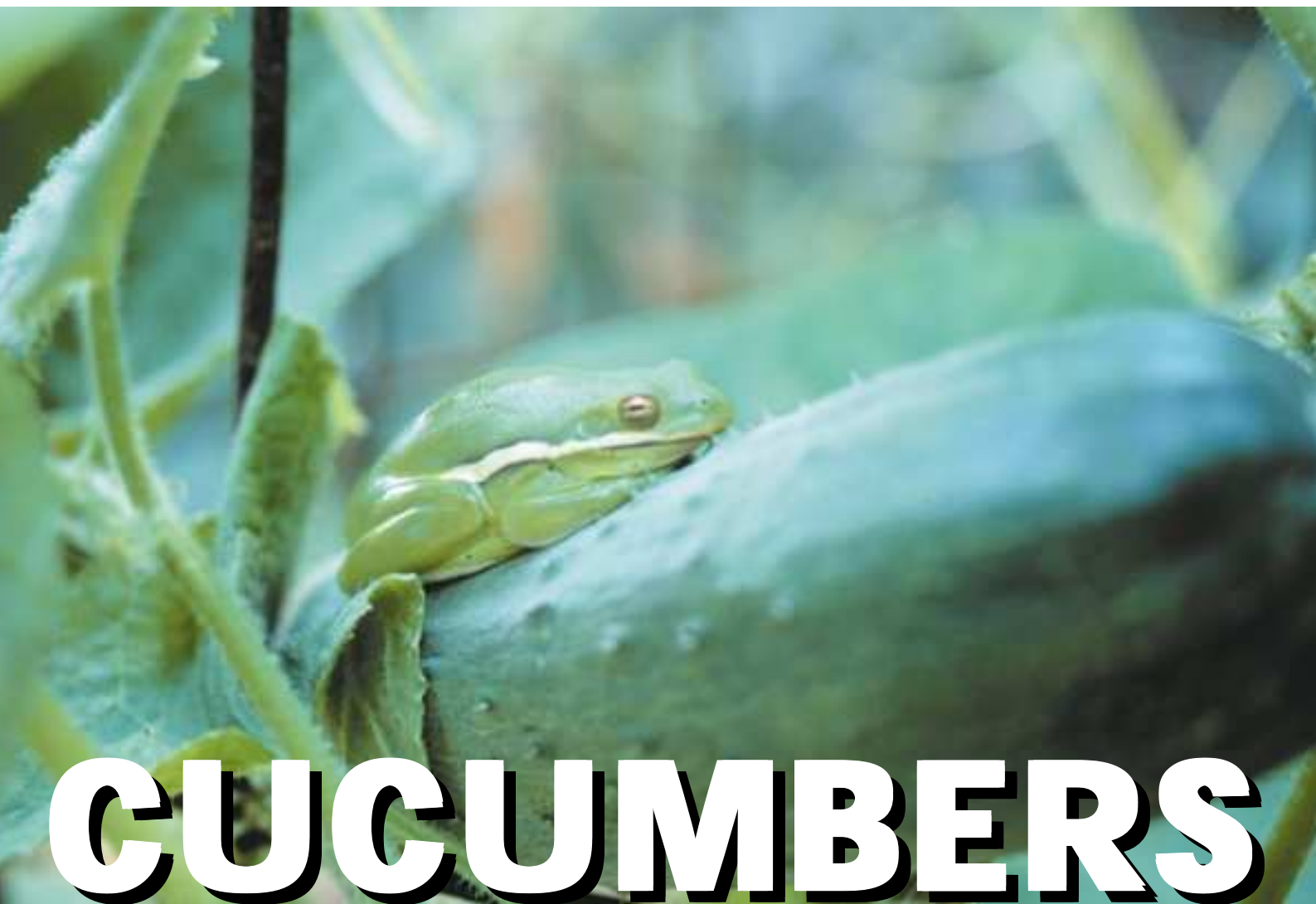
Incredibly, few congressmen are calling this proposal for what it is, namely, a barely veiled attempt by opportunistic politicians to subvert America's free enterprise system, which is the foundation upon which this country is built.

The Clinton plan would capitalize on Americans' fears that the social security system is on the verge of bankruptcy, that the social security trust fund has only government IOUs in it, and that their social security retirement money is no more secure than a White House intern in the oval office. These fears are all well-founded, because social security is going broke and action needs to be taken to save it. But Clinton's solution is not an attempt to save social security, but an attempt to inject major government control into the American economy.

Just as he attempted to nationalize one fifth of the nation's economy under the pretense of health care reform, Clinton now is attempting to put government control over American business under the guise of *saving* social security. Alarm sirens should be going off inside the heads of all freedom-loving Americans. It would mean the greatest increase in federal power since the introduction of the income tax; not even Roosevelt, at the height of the New Deal, proposed government control of American industry.

Truly privatizing social security by allowing participants to invest in 401K and IRA type accounts in the private sector would not only *save* social security by dramatically increasing participants' future retirement benefits, but it would increase the country's economic growth by making more money available for investment. However, letting the government invest the money in the stock market would strangle the private sector with government control, just as government has strangled it in other state-controlled economies. Saving social security would then become a moot point, because the economy will have been ruined, taking social security along with it.

Opportunists like Clinton and his fellow Republicrats are not interested in meaningful reform. They are interested in seizing the panic of the moment to further their own misguided socialist view of America's future. Don't let them! If Clinton can sneak this dirty trick past a gullible public and through a Congress that lacks the guts to stand up to this would-be dictator, then the American system will fall without a shot being fired. This sinister proposal places America at fascism's doorstep. Δ



CUCUMBERS

COOL IS THE WORD!

By Alice Brantley Yeager (Photos By James O. Yeager)

Have you noticed how the word “cool” has taken on an entirely different meaning than what Webster has defined? As far as temperature is concerned, the dictionary sticks to a middle-of-the-road definition—“neither warm nor very cold.” Children in particular tend to use the slang meaning and classify everything as “cool” that produces a favorable reaction with them—new clothing, rock stars, a favorite teacher, a teenage idol, and so on.

In the gardening world we apply the word to only one vegetable and that’s the cucumber. We don’t say beans, egg-

plants, okra, etc., are “cool.” Only the cucumber has the distinction of being “cool.” On a warm day prove this for yourself by cutting into a freshly picked cucumber. Cool!

As a further testimonial to cucumbers, they’re “good for you.” Some folks, including youngsters, hate that expression, but there’s no denying that cucumbers contain certain nutritional benefits. They have goodly amounts of calcium, phosphorus, and potassium and, as a fringe benefit, they contain the enzyme erepsin which helps digest proteins. To obtain the best food value, they should be eaten raw, but who can resist them in pickled form? (See the sweet lime and the sour pickle recipes.)

Oriental cooks often use cucumbers in their cooked dishes just as we use other vegetables such as beans, squash, etc. However we Americans tend to confine our main culinary use of fresh cucumbers to salads. That’s what we want when summer surrounds us and we’re looking for something cool. Tasty hot casseroles are great for winter days, but not when temperatures reach into the nineties.

Like any vegetable, the best cucumbers are going to be homegrown in one’s own garden. Harvested fresh from the vine, cukes are going to have more flavor than those supermarket varieties trucked in from hundreds of miles away. Always keep in mind that

Left: Before using pesticides, remember that we have friends in the garden.

the farther produce has to travel, the more nutrients and taste are lost.

Cucumbers are among the easiest vegetables for a gardener to grow. The vines require a soil with pH 6.0-8.0 which is compatible with most gardens. Soil should be moderately rich—sandy loam if possible. These plants do not do well in heavy soils that tend to hold water. If ground is poor and short of humus, some well decayed manure or compost should be worked into it a few weeks ahead of planting time. If one has to resort to commercial fertilizer, a side dressing of a tablespoon of 5-10-10 per plant when vines are starting to run will be beneficial. However don't be surprised if your cucumbers have a tendency toward bitterness when a commercial fertilizer is used.

Remember not to be too eager to plant cucumbers when a few warm days in early spring fool us into thinking cold weather has gone. It takes awhile for soil to warm up and for weather to really settle down. If planted too early, chances are the young seedlings will be chilled, growth will be stunted, and you may as well start over. Because of short growing seasons some gardeners start their plants indoors in peat pots and transfer them to their outside location when conditions are right. (One should always avoid disturbing the roots of cucumber transplants as they are highly subject to root shock.) Where there is a long summer season such as in our Zone 8, it is less troublesome to plant seeds directly into the garden soil, usually a couple of weeks after Easter.

Seeds should be planted not over an inch deep in sandy soil and a half inch in loamy soil. Space seeds about 6 inches apart with a view to thinning seedlings to stand 10-12 inches apart. (Cucumber seeds can usually be counted on to have a very good rate of germination.) Thinning should be done when plants are beginning to crowd each other but before they put out tendrils. Trying to thin plants that have



Standard varieties of cucumbers have both male and female flowers. Male flowers will drop off, but behind each female flower will be a tiny fruit.

begun to run and attach themselves to others requires the patience of Job.

Location is important to successful growing, as cucumber vines like plenty of sunshine and good drainage. Shady conditions are a no-no. With sufficient moisture and an organic mulch when hot weather comes on, vines can be encouraged to bear over a major part of the summer. Thirsty vines will begin to bear poor quality fruit with a stunted

appearance. One shouldn't expect juicy, picture-perfect cukes if Nature shuts off its water supply and the gardener develops a lazy streak.

Our preferred method of growing cucumbers is on a fence-wire support between posts. This promotes an easy way to handle the vines when weeding, harvesting, or watering. Vines take to wire supports as soon as the first tendril

comes into contact with the wire. From then on, we just tuck in stray runners.

Years ago, when a sizable garden was a must for large families and ranked right up there with keeping milch cows and hogs, cucumber seeds were, for the most part, planted in "hills." The vines rambled everywhere and weeding was almost impossible. A good downpour could coat the cukes with dirt making a thorough cleaning necessary before the fruit could be used. I am convinced hunting the fruits and picking them on ground level gave vent to the expression, "My aching back!"

Grown on an upright support, it is easy to see the cucumbers and keep track of their size, particularly if one is growing them for a specific purpose such as small pickles. Also, long types do not curl and twist in shape as they do when growing flat on the ground. Another drawback to ground level is

that it makes the fruit easy prey for sowbugs, snails, terrapins, etc. These interlopers know a good thing when they see it.

Young plants must be kept free of weeds and grass. Soil should be lightly cultivated to break up any hard crusts that may form when soil dries out after heavy rains. As soon as vines are tall enough to begin climbing their support, mulching with organic matter (leaves, grass clippings, pine needles, etc.), will make cultivation unnecessary. Mulch attracts and shelters diligent workers called earthworms and they are worth their weight in gold to gardeners.

Cucumber vines, like other garden plants, are subject to certain diseases—powdery mildews, mosaic virus, bacterial wilt, and anthracnose. These all seem to be more prevalent in one area than another and also worse at times. If a gardener has severe problems with one

or more of these, I strongly advise planting disease resistant varieties of cukes and religiously rotating the cucumber space each year. County extension agents should have the latest information on controls.

A number of pests zero in on cucumber plants so it is well to keep a sharp lookout for them. Young plants are subject to cutworms. Those fat culprits usually do their dirty work at night or on very cloudy days. They rest during daylight hours underneath small clods of earth or debris and begin feasting on tender plants at night. A telltale sign of cutworms is finding plants cut off at the base or just above the soil line. I dislike using poison in a garden, but, if the infestation is severe and you are losing a number of vegetable plants, it may be well to very lightly sprinkle 10 percent Sevin dust around the base of your plants. If there is only a loss of a plant



A nice basket of Sweet Slice Hybrids ready for pickling or enjoying fresh



Grown on support, cucumbers can be found and harvested easily.

here and there, you can find the evildoers by turning up a bit of the soil in the vicinity where plants have been attacked.

Other pests mainly include squash bugs, spotted cucumber beetles, and striped cucumber beetles. If they don't show up in great numbers, hand picking will get them. If they seem to be out of control, however, a light dusting of Sevin dust may be necessary. This is where a small dust gun comes in handy. However, always keep in mind that you may do more harm than good using a pesticide as you can do in some beneficial insects without even knowing it. For instance, there are a number of small pollinating bees and wasps, as well as honey bees, that we hardly notice but that can be killed by the use of pesticides. No organic gardener wants to execute the good guys.

There are many varieties of cucumbers to suit every appetite—bush, standard, burpless, and so on. The bush types are ideal for folks with limited space as they may be grown either in large pots on a patio or in the ground. Burpless cukes are favorites as they tend to produce no after effects when eaten. Standard and burpless types give the best yields, require more space, and are generally grown in average size gardens.

Do not be discouraged if vines start off producing a number of flowers and no fruit. Standard varieties are monoecious (have both male and female flowers). The male flowers will drop off. Behind the female flowers there will be a tiny cucumber which will develop into the desired fruit. There are gynoecious cucumbers, too, that have only female flowers, but both types need pollination. Slicemaster Select Hybrid is a gynoecious type and is a good producer.

No cucumbers should be allowed to ripen on the vines as this will definitely slow down or end the crop. Fruits should be picked at least every other day. When refrigerated they will keep for several days depending on the variety, some being better keepers than others.

Sweet Slice Hybrid, a standard variety, is one of our favorites. It is a prolific performer and has very uniform fruits. They may be used for small pickles when 2-3 inches long, for lengthwise sliced pickles when 4-6 inches long, and for sliced pickles when over 6 inches. This is a burpless cuke—crisp, thin-skinned with very good flavor and no trace of bitterness at any stage. Vines have good disease resistance making it a nice choice for home gardens.

There are lots of varieties of cucumbers to be grown, but usually only one or two commercial types are seen in the supermarkets unless we are lucky enough to have access to some ethnic markets. Therefore it's up to the home gardeners to get acquainted with some of the "different" cucumbers. These can include Armenian, Suvo Long, Lemon, Gherkin, Tamra, etc.

Armenian cucumbers are very long, often called "yard longs" and should be

SEED SOURCES

SWEET SLICE HYBRID

Vermont Bean Seed Co.

Garden Lane

Fair Haven, CT 05743-0250

J. W. Jung Seed Co.

335 S. High Street

Randolph, WI 53957-0001

Park Seed Co.

1 Parkton Avenue

Greenwood, SC 29647-0001

TAMRA

Shepherd's Garden Seeds

30 Irene Street

Torrington, CN 06790-6658

ARMENIAN

Gurney's Seed & Nursery Co.

110 Capital Street

Yankton, SD 57079

SUYO LONG

Pinetree Garden Seeds

Box 300

Gloucester, ME 04260

LEMON

Park Seed Co.

Gurney's

GHERKINS

Pinetree Garden Seeds

Most seed companies carry a number of bush or patio varieties.

Sour pickles

This recipe will remind you of the days when a nickel would buy a mouth puckering, delightful pickle that would last all day. Maybe these wonderful culinary specialties still exist somewhere, but, until you can find them, here's a recipe to help out. Generally, the nickel pickles were made from fairly large cucumbers about 4-5 inches long and served from oak barrels or large glass jars. Times have changed. We recommend using smaller cucumbers so as to be able to pack more of them into pint or quart jars, or, when ready to can, slice the cucumbers lengthwise into quarters.

Remember Rome wasn't built in a day and the same applies to anything requiring a brining process. Don't be discouraged by the time element. Keep your eye on the goal, which, in this case, is delicious sour pickles.

STEP 1: Wash about $\frac{3}{4}$ peck of fresh cucumbers in cool water being careful not to damage the skins. Weigh and put them in a clean scalded crock. Cover with a 10% brine solution made by dissolving 1 cup dairy or pickling salt in 2 quarts of water. (An egg will float in a 10% brine.) To keep cucumbers from floating, weight them down with a fruit jar of water placed on top of a clean heavy plate. Drape a thin kitchen towel over the crock. About 12 hours later or over night add 1-cup salt for each 5 lbs. cucumbers. Put the salt on the plate so it will gradually dissolve and not suddenly sink to the bottom creating too much brine intensity at one spot. During this curing process, if at all possible, try to maintain a temperature of 80-85F. This helps control brine strength.

STEP 2: Keep film removed during fermentation as film can promote spoilage. At week's end and thereafter for 4-5 weeks, add $\frac{1}{4}$ cup salt, always placing it on the plate. Fermentation usually lasts about a month. Bubbles will cease and no more salt is required. Cucumbers are now "cured." Keep in the brine until you're ready to make pickles.

STEP 3: About 3 weeks before the anticipated pickle making, prepare the following solution for each 6 quarts of cucumbers.

Vinegar solution

1 gallon vinegar (clear or apple cider)
2 cups sugar
 $\frac{1}{2}$ oz. whole allspice
 $\frac{1}{2}$ oz. whole cloves
1 stick cinnamon
1 piece mace

Place all spices in a clean cloth bag. Bring all of the above to a boil and simmer 15 minutes. Cool, cover, and set aside for 3 weeks before removing spice bag. Keep bag for further use. When dealing with anything acidic, such as vinegar, always use stainless steel or graniteware vessels. Never use iron, copper, aluminum, or galvanized.

STEP 4: When ready to begin the pickling process, bring 1 gallon of the vinegar solution to a boil. Add one-fourth of cucumbers and boil 2 minutes. Likewise with other 3 portions. Be careful not to boil until soft. Put cucumbers in clean crock, cover with the hot vinegar and add the spice bag. Cover top of crock with plastic wrap securely held in place to exclude outside air. Let stand in a cool place 6 weeks. Remove spice bag in 3 weeks.

STEP 5: FINALLY it's time to can the pickles. Pack pickles in sterilized jars and cover with vinegar solution. Adjust lids and process in simmering water bath (180F) 10 minutes. Remove jars and complete seals. Set aside and cover with a light towel until cool. Admire your pickles for several days before beginning to use them. During this time, the flavor actually improves.

Some old cooks layered clean grape leaves in the brine with their cucumbers. This stopped the growth of enzymes that could cause cucumbers to soften. Leaves were discarded when the pickling process was started.

grown on a fence or trellis to insure long straight fruit. They have a ribbed skin but need no peeling. Their light green color is outstanding in salads.

Armenians are burpless with a mild, delicious flavor. Quality is diminished if fruits are allowed to fully mature, so they should be picked before they reach

that stage. Suvo Long is not one of our favorites although it does have some merit. It is long and slender growing to about 15-17 inches and is burpless.

Cucumber boats

Fresh, medium size cucumbers. Prepare as many as needed for the salad lovers.

Wash cucumbers thoroughly, dry and slice off bottoms lengthwise so they will sit straight on serving plate. Scoop out about one-half inch of the center lengthwise of each cucumber and put pulp in a mixing bowl. (Cucumbers now resemble boats.) Mix pulp with mayonnaise, finely chopped celery, green onions, radishes, ripe olives—anything that suits your fancy. Maybe you'd like to add some tiny cooked shrimp, tuna, etc., and perhaps you'd like to put in some special seasonings. Just remember to let the cucumber taste come through. Garnish with sprigs of parsley, watercress, or maybe some cherry tomatoes.

Sweet lime pickles

STEP 1: 7 lbs. or 1 peck medium-large cucumbers. Wash in cool water to remove dust, etc. Slice in ¼-inch rounds and place in large crock or churn. Cover with solution of 2 cups household (powdered) lime to 2 gallons cold water. Leave to soak for 24 hours in cool place. Occasionally stir gently to keep lime in suspension as it will have a tendency to settle.

STEP 2: Drain cucumbers and rinse well. Soak in clear cool water for 3 hours.

STEP 3: Drain and cover with the following mixture:

10 cups sugar

1 Tbsp. salt

10 cups apple cider vinegar

1 tsp. mixed pickle spices

1 tsp. celery seed

1 tsp. whole cloves

If you like a peppery pickle, also put in 1 teaspoon red pepper flakes. Soak overnight.

STEP 4: Using the Step 3 solution, boil cucumbers in stainless steel or graniteware pots (Do not use aluminum.) about 30 minutes or until cucumbers begin to take on a clear appearance instead of white.

STEP 5: Pack slices into hot sterilized jars. Cover with hot solution and seal.

Cucumbers - plain and simple

Although cucumbers are used in many salads, the way I first became acquainted with cukes was plain and simple. My father, who came from Tennessee, used to bring in some cucumbers from his garden, wash them and prepare a very satisfying side dish to go with other food. He peeled the cukes if they had tough skins, but not if they were young and tender. Then he sliced them crosswise in thin slices and put them in a bowl with some sliced white onions and poured some table vinegar over them. Some ground black pepper was added and the dish set aside for a few hours until mealtime. Simple and very good.

Flavor is very sweet and seeds are small, but skin is quite ridged and spiny.

Lemon cucumbers are undoubtedly named "lemon" because of their appearance and not their flavor as they have a sweet cucumber taste and good crisp texture for pickling or salads. Some folks like to eat them as they would a crisp apple. They need to be picked young before they become tough-skinned.

Gherkins are usually very heavy bearers of small, oblong, burr-like fruits that are good for making small pickles. They are not recommended for slicing and eating fresh.

Tamra is an excellent cucumber for the home garden and you'll probably

never see it in a market as it is too delicate to endure a long haul. It is great for eating right off the vine and has a mild delicious taste. In our 1998 garden the vines showed remarkable resistance to viruses and mildew, bearing throughout some of the worst gardening weather we have endured in years. The season started out with too much rain. Then came the drought and high humidity when temperatures soared into the lower 100s and stayed there. It takes a stout plant to stand all of that.

Cucumbers have been pickled with garlic, hot pepper, brown sugar, and all manner of spices to give them varied flavors and textures. Everyone has his/her own favorite pickling recipe—

hot dills, sweet pickles, 14-day pickles, bread and butter pickles, mustard pickles, and on and on. Back "in the good old days," there were large glass jars full of big sour *nickel pickles* sitting on the grocer's counter. That was when a nickel was worth a nickel. One of those piquant, spirited pickles wrapped in wax paper for holding in hand could be enjoyed all day—kinda like an all-day sucker.

So, if gardening is your cup of tea and you'd like to raise some really outstanding cucumbers, try some of the home garden varieties. You might just come to be known as the coolest gardener around. Δ



MILLENNIUM VEHICLES

By Michael Hackleman

A major failing of transportation worldwide is that 99.9% of vehicles on farms, street, and freeways work on **one** energy source: liquid fuels. In any disaster—small or large, local or global, short-term or long-term—this puts simple transportation at risk. Will your local gas station have a supply of fuel? Is there electricity to pump it from the tanks? Wouldn't it be nice to own a vehicle that didn't depend on gasoline, diesel fuel, or propane to operate? Actually, there is: the electric vehicle. It runs on the electricity from batteries. And, in the absence of utility power and standby generators, the batteries can be charged directly from the sun, wind, and water all around us.

My own awakening to the benefits of electric vehicles (EV) began in the mid-1970s. I was building a research center and wanted it and my home to be self-reliant. I began the search for an alternative to my gasoline-powered car and truck. At first, I investigated alternative fuels. Methane (biogas). CNG (compressed natural gas). Alcohol. Hydrogen.

During this process I discovered an ugly truth about internal combustion engine (ICE) technology. The engine itself was a bottleneck, wasting an average of 70-90% of the energy of **any** fuel it consumed as it did its work.

My research also revealed that, in 1900, steam cars and electric cars had dominated the roads. An electric-powered vehicle? I daydreamed about



Solar panels recharge an electric motorcycle miles from grid power.

The electric OX

I found the original chassis for Ox, an industrial vehicle, abandoned in a Goodwill resale yard in Orange County, California, in 1972. It looked awful. A closer inspection revealed good tires, a 1-1/2 HP series motor and gearbox, and a solid frame. It had six 6V deep cycle batteries below the flatbed. I bought it, coaxed it up into a flatbed truck, and drove it home.

I tried for a month to revitalize the batteries (understanding very little about sulfation at that point). They gassed so badly during charge that eventually a spark blew one of them up and I traded them in for a new set.

While I was undecided about what I wanted to do with this vehicle, its ungainly front end wasn't part of any scheme. I set about with a torch to cut it off. Once done, I was surprised

at how much weight I had just shaved off the vehicle. Suddenly, I had a very spry electric!

I had fantasized great things for this EV. In the end, the reality of what I did have soaked in. Instead of adapting it to be a street machine, I worked within its constraints to build something for use around the farm. I bolted in a new front seat and rigged up a tiller for steering. I welded together a front assembly to protect the passenger and driver, and the steering, brake and accelerator linkages. I named it Ox.

Ox plugged directly into our wind-machine(s) whenever it was not in use. This helped it maintain a high state-of-charge. A monthly water and hydrometer check, equalizing charge, and battery washdown was the only care it got. It was a happy feeling to drive around the farm on wind-watts.

Eventually, I restored an old 220-watt vibrator-type inverter for use in Ox. It supplied 110Vac (60-cycle) directly from Ox's 36V battery bank for soldering irons, power tools, and even my typewriter.





Wind-generated electricity was used to recharge Ox.

plugging a car into one of my wind-electric machines. A few months later, this dream came true with Ox, my first EV. I was driving on wind-watts! I had found an alternative to the ICE car and gasoline.

What is an EV?

An EV is a vehicle that has an electric motor instead of an engine and a battery pack instead of a fuel tank. How does it work? A battery pack, consisting of between 8 and 16 deep-cycle, lead-acid batteries, feeds electricity to a motor connected to the vehicle's transmission. The accelerator pedal cable is attached to an electronic speed control, similar in size and function to a light-dimmer switch. This unit efficiently and quietly controls both the power and speed of the motor and the vehicle. Taking the foot off the accelerator permits the vehicle to coast. Or, if your controller has "regen," the vehicle will slow down at the same time it reclaims some of the vehicle's momentum as electricity, recharging the battery in the vehicle. This feature is important in hilly terrain.

Since 1972, I have converted and scratch built dozens of electric vehicles. Conversions are vehicles where

the engine and related hardware—fuel, cooling and exhaust systems—are removed and replaced with an electric motor, batteries, and charger. Scratchbuilts are lightweight vehicles that are designed with EV propulsion systems. These and other EVs are described in detail in two books I've written on the subject.

EVs designed for the highway and freeway have battery packs that are generally too big to be recharged daily by modest renewable energy (RE) systems. There are exceptions. This article will focus on EVs that are useful for work and transportation that may be recharged from the sun, wind, and water of smaller RE systems.

The electric Ox

My first EV was a revived industrial electric vehicle that I transformed into a farm vehicle. It was simply a golf cart with a flatbed. Its 36-Volt battery pack was a close match for use with my farm's 32-Volt, wind-generated electricity.

For seven years, Ox was our farm's workhorse vehicle. It traversed every kind of terrain. Its 1.5 horsepower series motor would kick in the torque to tackle the steepest grade or the softest ground. The heavy duty FNR (forward-neutral-reverse) switch and the accelerator pedal were the only operator controls. No meters or other instrumentation were ever installed. The original six-position series-resistance (non-electronic) controller proved adequate for our needs.

The greatest discovery with Ox was that an EV is also a portable power station. Accordingly, I rigged up a receptacle box on Ox's side. Wherever I went, I could plug in a variety of 32V tools—a drill, cutoff saw, welder, etc. Eventually, an inverter added 110Vac capability to the mix. I spent whole afternoons typing away out in a meadow with Ox parked silently nearby, supplying the power for the electric typewriter. I wrote big pieces of several of my

books out there. When I sold my farm, Ox stayed to give the same service to the new owner.

My fondest memory of my 10-year adventure in farm living outside of Mariposa, California is the way that Ox and my windmachines complemented the silence of the land that surrounded our home.

Virtually any golf car or cart is a good starting point for a vehicle of this type. These are quickly abandoned by golf courses or industry when cosmetically damaged or beyond a certain service life. Good sleuthing or "wanted" ads will help ferret them out. Inspect the vehicle's motor and gearbox first. Next, check out the controller, and steering and brake systems. At least, they should have all the parts! Tires are replaceable, but expensive and a hassle. If it's been sitting for a while, figure that the vehicle's batteries are scrap. Your first offer should be to remove it for the labor of hauling away garbage. If you can't get it for less than \$50 bucks, continue looking. If it's not operable, you're the one who's taking the risk.

An electric Mule

One of the slickest EV conversions I've seen involved an ATV (all terrain vehicle) on a 67-acre organic farm outside of Hilo, on the big island of Hawaii. Harry MacDonald wanted a work vehicle that would haul compost, deliver machinery for maintenance without breaking up the fragile turf, and emit no exhaust. To this end, Harry engaged Tom Carpenter to convert a 2WD Kawasaki 500 Mule to electric propulsion.

The Mule's steady work is hauling compost around the farm on dirt and gravel roads and slick turf. It also routinely transports mowers and weedwackers to work areas. Tom rigged the Mule's system to power tools at remote sites directly (with an inverter), avoiding the use of an engine-generator. The silent ac power was an instant success. Remarkably,

An Electric Mule

In the first step of converting a Kawasaki 2WD Mule to electric propulsion, Tom Carpenter removed the engine, transmission, and engine-related components. A 3/8-inch aluminum motor mount was welded together and bolted to the original engine mounting holes. A 6HP Advanced DC series motor was coupled to the locking differential (internal 6:1 ratio) with a 1:1 ratio of timing belt pulleys.

The potbox for the Curtis 1205-201 controller (36-48V, 350A) was connected through the existing throttle cable to the footpedal. Forward and reverse are handled through the stock (mechanical) linkage. A DC contactor was selected for keyswitch operation, and a DC-DC converter handles 12VDC (aux) loads. A dual main circuit breaker was added to isolate the battery pack from the vehicle for servicing. With a wet climate in mind, Tom installed the controller, contactor, pot box, meter shunts, and a 12VDC fuse strip inside a plastic Carlon box. An outdoor timer box, mounted under the front seat, housed the circuit breaker near the driver.

There was room for six batteries in the Mule, five in the rear and one under the single front seat. Would the batteries be 6V or 12V? Since the vehicle was intended for farm work, rather than recreational or street use, Tom opted for 6V batteries, for a pack voltage of 36V.

Sealed, absorbed-glass matte, deep-cycle batteries were selected for the Mule. Used in wheelchairs and other motive power applications, the Concorde 6V batteries weigh 68 lbs each, are rated at 180Ah (20-hour rate), and use lug terminals. To support the five batteries, Tom fashioned an aluminum frame from 1-1/4 inch aluminum angle and popriveted it together. The sixth battery of the pack

is mounted on the metal floor just under the front seat.

Far from utility lines, the Mule is charged by solar power. Initially, it was designed to recharge from several solar "stations" sited throughout the land.

Each station is composed of a dual-axis solar array (15 Solec S100s), a battery pack (24VDC, 1,400Ah capacity), and an inverter (Trace 4024 sine-wave 4kW, 120Vac). A K&W charger (120Vac input, 24VDC output) was purchased to recharge the Mule's batteries.

A subsequent expansion of the Mule's role revealed an alternate charging system. A new building was planned. Normally, the Mule would lug a 5000-watt generator to a worksite when power tools were needed. Instead, Tom tried out an idea, rigging the Mule as the power source. He attached a quick-release plug to a Trace inverter (36VDC input, 120Vac output) to tie into the battery pack.

Since the Mule would be sitting all day at the building site, Tom also installed three 100-watt Solec panels on the Mule's roll bar assembly. A Heliotrope CC20 charge controller was added to protect the batteries from overcharge. The silent ac power was an instant success, with the meager solar input keeping pace with the intermittent high-power consumption from tools.

At any time, the Mule's driver can scan the dashboard-mounted ammeter and voltmeter to check



battery condition. A cycle computer (VELO) was added to watch vehicle speed, distance, and time. It also recorded the maximum speed and accumulated distance. The magnetic sensor was glued to the left rear wheel, the magnetic pickup was secured to a brake line, and the computer was calibrated to the tire's circumference.

What did it all cost? The basic conversion kit (\$2,160), battery pack (\$600), DC-DC converter (\$190), and miscellaneous hardware and aluminum angle (\$250) totaled \$3,200. Add to this 30 hours of Tom's time. And this was a prototype!



A gearbelt delivers motor power to the stock transmission, eliminating the less efficient infinite ratio drive unit.

Electric-assist bicycle

The ZAP (zero air pollution) kit is available for people who wish to purchase an electric-assist option for their bicycle (see Sources). Do-it-yourselfers with metal and tool working skills can build their own. Components for an electric-assist bicycle (EAB) will have these general specifications.

Motor: 12Vdc, PM (permanent magnet), 2700-3500 rpm, demag current max greater than 20-25 Amps, 3-4 lbs weight. Mounts to frame behind and below seat.

Controller: A high-current DPDT relay, slaved to a 2-position toggle switch, selects 12V (slow) or 24V (fast) to the motor by configuring the battery pack into paralleled (12V) or series (24V) wiring. Downhill regen braking works in 12V position. A GO (push) button connects pack to motor, and is released during slow-fast selection. The addition of a switch, microswitch, and additional relays adds two dynamic braking rates (resistor and short).

Battery Pack: Two 12V batteries (lead-acid, nickel-cadmium, or nickel-metal hydride) make up the battery

pack. At 10-15Ah each, the pack will weight 10-20 pounds.

Drivetrain: V-belt, cogbelt, or chain. At 25 mph, a 26-inch wheel is turning at 325 rpm. The stock spoke-pulley is 14 inches in diameter. With a 1.5-2 inch pulley on the motor, a 7-9 to one ratio will result. An 8-12 tooth cog on the motor and an 80-120 tooth gearbelt rim pulley will also complete the EAB drivetrain.

Additional components include the wiring harness, fuses, molex connec-

tors (aid in motor and battery removal), battery charger connector, circuit breaker (rated to protect the motor from demag currents), and a Voltmeter (a simple multimeter will suffice).

What does it cost? Motor: surplus, \$15-25. Battery: 17 Ah (\$62) or 33 Ah (\$71); purchase batteries locally to save shipping costs. Relay: DPDT, 50-amp rated (\$25); avoid using solenoids with high-current coils. Molex connector set: \$10. Misc switches, wires: \$10. Spoke-wheel pulley: no current source.



the 6-Amp charge rate from solar panels installed on the Mule's roll bar kept the battery pack topped off despite the constant drain of power tools through the workday. Drivers got into the habit of always parking the Mule in the sun. While the farm has several solar stations of larger size, Tom realized after four months of continuous operation that the Mule had never been plugged into even one of the solar stations!

The Mule's performance was also a surprise. In a trial run, Tom went 35 miles at an average speed of 13.8 mph, with the top speed (downhill) reaching 27 mph. Adding two more batteries (bringing the pack up to 48VDC) brought the Mule's average

speed up to 17 mph for the same distance of 35 miles.

ATV's like the Mule are useful around the farm or homestead for transportation or hauling materials, produce, and compost. Since the cost of repairing or replacing the engine and drivetrain (damaged or destroyed through abuse) is prohibitive, many ATVs go into an early retirement. This is a boon for anyone who would like to convert one to electric propulsion. (Carefully inspect any such find. Damage to the suspension, steering, or chassis can also be expensive.)

There are three problems with ATVs: limited space, a high CG (center of gravity), and a short wheelbase. If the batteries can be mounted low,

the vehicle's CG will prove more stable.

Electric-assist bike

The bicycle is the most efficient machine ever developed for transporting people about. I had been working with EVs for more than 15 years before I witnessed a human-powered vehicle (HPV) competition. This and the Gossamer series of human-powered aircraft awaken me to the true power and potential of HPVs combined with electric propulsion. Understandably, I had dismissed bicycle technology as being too light to carry much in the way of batteries. No

The Hawk

The idea to build an electric motorcycle came to Ely Schless in the middle of an engine rebuild for his primary racing bike, a 650 cc, 1988 Honda Hawk. The engine needed \$1,500 worth of work. Ely had already lightened the motorcycle for racing, stripping 100 pounds from the original 400 pound curb weight. Suddenly, he wanted a "non-oil" entity. I wanted an electric. Ely affixed a matching "S" in front of the HAWK to originate the catchy name for his conversion. He custom-fit the 6 HP series motor, sealed lead-acid batteries, and the electronic controller into the Hawk frame, drivetrain, and throttle controls.

The result was a user-friendly machine. People who have never driven a motorcycle seem willing to try the Hawk. Remember, there's no noise, no smell, no clutch, and no possibility of "stalling" the engine. Everyone gets it right the first time.

What did the Hawk cost Ely Schless? \$140 each for 4 chargers, \$120 each for 4 batteries, \$450 for the motor, and \$500 for the con-

troller. Ely works his own well-equipped machine shop, so everything needed for this conversion cost him only the materials.



Right: This select motorcycle is easily charged from a few solar modules and only twenty-five cents worth from the grid.

one came up to me and said, "So what?"

In bike circles, a favorite discussion is the "accumulator." Bicyclists hate to stop at intersections because braking a bicycle throws away the energy of momentum gained from leg muscles and rudely dissipated as heat in the brakes. The accumulator, then, is a technique of storing the bicycle's momentum and using it for takeoff.

What if the accumulator is a battery pack? A small electric motor can be added to a bicycle to assist the pedal effort. Even the simplest circuitry (no electronic controller) with a PM (permanent magnet) motor will produce regenerative braking if desired. The ZAP—a popular kit for adding a

motor and battery pack to a bicycle—uses precisely this technique. The battery pack acts like an accumulator. The motor reclaims 30-50% of the momentum of bicycle and rider by converting it into electricity, routing it to the battery.

In the electric-assist bicycle (EAB), the electric motor is small and the human effort still reigns supreme. The EAB's operator, then, gets help with acceleration, cruising, hillclimbing, and braking. Any attempt to operate the EAB without pedal effort will quickly drain the small battery pack. My own experience suggests that many bicyclists will find a well-designed EAB a pleasure to operate.

The basic EAB is composed of a small PM (permanent magnet) motor, a 12-24V battery pack, a fixed-ratio drivetrain, and a control unit. It includes mounting brackets and hardware, a wiring harness, and a battery charger. Installed, the electric-assist option could add 12-22 pounds to the bicycle's weight. The amount of battery capacity (short vs long range) accounts for the weight variance. Watch out! A combined motor and battery weight greater than 25 pounds seems to severely compromise pedal-only input and dictate the addition of better suspension. Circuits for regenerative and dynamic braking should be added to help brake the additional weight. Electronic motor control is

generally not recommended for an EAB. Commercial units are expensive (\$175-225) and do NOT include regenerative braking.

Since the drivetrain is a fixed ratio in the EAB, the motor must be “geared” for the desired operational speed. Ask yourself, “How fast do I want to go?” When geared for high-end work, the EAB will accelerate slowly and gobble power on startup if there is no significant pedal input. It is generally better to design for low-end work, such as hill-climbing. This will also make for better “braking” in downhill grades.

Many designs exist to transfer the motor power into bicycle propulsion. Hub, tire drive, rim-pulley, and spoke-pulley are examples. None of these designs interact directly with the bicycle’s stock chainworks (pedal, chain, sprocket, and idler system).

There are several reasons why it is **not** a good idea to mix electric propulsion with the existing chainworks. First, most bicycles use a “free-wheeling” rear wheel. This allows power to flow only one way: from the pedals to the wheel to the road. A ratchet inside the hub between the axle and the wheel performs this job, engaging in one direction, but slipping in the other. When you stop pedaling, the pedals and chainworks stop, while the wheels keep on turning.

Free-wheeling has the obvious benefit of maintaining efficiency. More importantly, however, it keeps the road and wheel from powering the chainworks. If the road and wheel could power the pedals through the chainworks, the pedals would never stop rotating while the bike was in motion. At high speeds, this could be nasty. Integrating the electric motor into the existing chainworks would partially defeat this feature, allowing both the wheel and the pedals to be powered by electric drive.

There’s a second problem when the motor drive is interfaced with the existing chainworks—the finished system loses the ability to employ

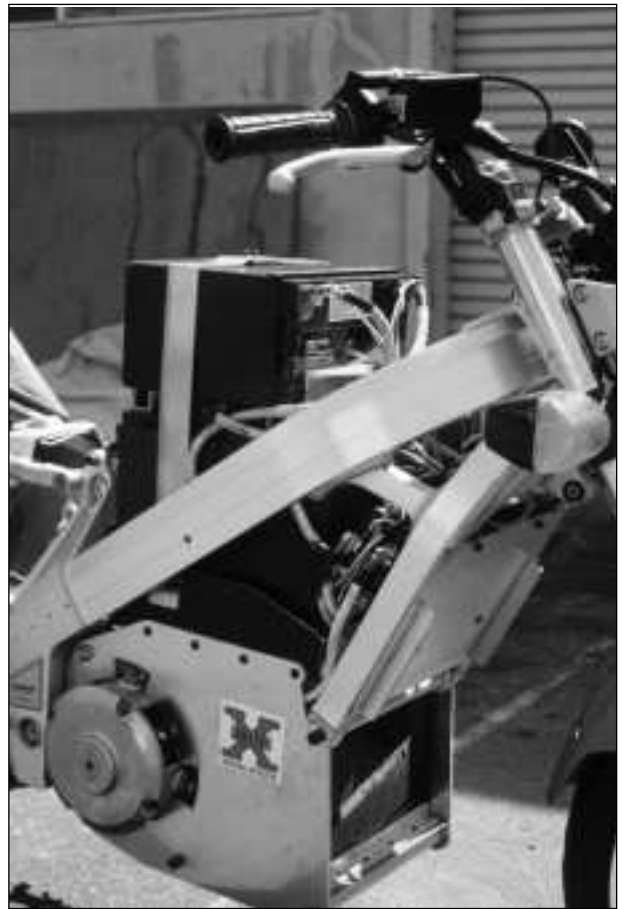
regenerative or dynamic braking. Since a free-wheeling rear wheel will not “power the pedals,” it also will not transfer momentum into the motor via the chain! Ergo, no regenerative or dynamic braking.

The preferred methods of motor connection—tire drive or a separate pulley drive—operate independently of the bicycle’s free-wheeling hub. Each transfers power directly to the tire or the wheel on the “pavement side” of the wheel axle. Thus, they work in parallel with (but independent of) the stock chainworks, while powering the vehicle or recovering power during braking.

You may want to retain the option of quickly converting your electric runabout back into a standard bicycle. Motor mounts, battery holders, and all wiring are best installed permanently. Quick-release bolts or fasteners should ease the removal of motor, battery pack, and controller when non-electric operation is desired, or to prevent theft. If these fasteners are padlocks, you’ve now got a security system.

There is an optimum weight for the electric-assist bicycle. Twenty-five (25) pounds seems to be the upper limit of hardware—motor, battery pack, controller, and wiring. Above this amount, pedal-only operation is difficult and additional suspension is required.

Allow 3 lbs of motor and 2 lbs of controller for the EAB. Limit the battery pack to 15-20 lbs. A 12-Volt, 25-Ah NiCd or NMH (Nickel-Metal-



Four 12V sealed lead-acid batteries just fit under the tank in the Hawk.

Hydride) battery pack will weigh approximately 18 lbs.

In California, a motor-driven bicycle is easy to register (license) and requires no insurance. A helmet may not be required for an EAB, but its operator should wear one.

Single-gear and 3-speed bicycles typically make poor EABs. Ten-speed mountain bicycles seem to be the norm. This isn’t a hard and fast rule; just an observation. Lots of gear choices help the rider “match” the motor’s effort, particularly during hill-climbing.

Shawk

A good example of a straight conversion of a motorcycle to electric propulsion is the Shawk. Designed and built by Ely Schless, the Shawk

A street machine

Based on my experiences with lightweight EVs, I have the following recommendations for a high-performance, long-range street machine.

Design for a 1300-lb running weight (includes 175-lb driver. Add passenger weight). Use a 120V pack. For example, using the 27TMH series, the 10 batteries will weigh 720 lbs. This leaves a body and frame weight of 405 lbs to stay within design limits.

Fit an all-weather, aerodynamic shell. Sketch it in some detail. All components will need to fit inside. The canopy-roof should remove for touring. Integrate a roll-bar into the rear bulkhead support. A high-threshold door for ingress and egress on one side will give a sporty access but maintain overall, lightweight structural support.

Position the driver and passenger in tandem-offset seating above the battery pack. This ensures good visibility for the driver. The high profile helps other people see this vehicle, too. This design positions the battery weight low, center, and forward for

stability. This "stacked" arrangement minimizes vehicle width and length.

Consider an exchangeable battery pack. The pack can be split into two identical, 360-lb "modules" of 60V each. These may be saddlepacks or extend, side by side, across the width of the vehicle. A community service center can be built to maintain the packs, leasing them (yearly) to owners for home charging, and exchanging the packs when extended range of the vehicles.

A 10 HP series motor and electronic controller would make up the propulsion package. A 4:1 (fixed) gearbelt drive will power the vehicle

to 60 mph, but ensure good low-end performance. Electric reverse and regen braking should be included.

The vehicle can be arranged as a standard 4-wheeled EV or as a motorbike (3-wheels). In the 4-wheeled configuration, the FRW (front-to-rear weight) ratio is 1:1, with the rear wheels driven through a simple lawnmower (seated type) differential. In the 3-wheeled layout, the two front wheels are both steered and powered. Maintain a FRW (front-to-rear) ratio of 4:1 for good stability. With this low a vehicle weight, the rear wheel supports too little weight for good traction during acceleration or regen braking, hence the preference for front-wheel drive.



Right: The Speedster II is a good runabout.

started life as a Honda Hawk. Ely brought his experience as a racing motorcycle mechanic and competent machinist to the project. It was needed. In the space normally occupied by the engine, transmission, gas tank, and exhaust pipes, Ely cleverly adapted the small space to hold four (4) batteries, the motor, and controller.

With virtually no background experience in EVs, Ely got it all right the first time. The novice EV designer might think the Hawk's system undersized with a 4½ HP motor and only 48 Volts of battery pack. However, the motor is a series type,

ensuring high torque at zero RPM. It's enough to move 550 pounds of bike and rider off the line with gusto. The PMC controller will channel 350 Amps to the motor if the batteries are able to deliver it. At 35Ah, the pack is light on energy density (duration) but easily delivers the high current (power density) to meet the motor demands. If you do the math, this combination of motor, controller, and drivetrain is able to deliver as much torque as an 18 HP engine.

Ely was test driving the Hawk when I first met him. Several months later, I test drove the Hawk for

myself. It felt perfectly natural to get on, turn on the key, and power it into the street. When fully charged, the batteries will let you chirp the tires. Acceleration is brisk—all the way up to its 40 mph cruise speed. More modest acceleration will ensure a range of 15 miles.

The single-ratio, gearbelt drive of the Hawk strips the motorcycle of its intimidation to the novice. In addition to the lack of vibration and engine sound, there are no gears to shift and no clutch to operate. The motor cannot be stalled. Even at speed, sounds from the environment can be heard through

the helmet, a feature I found particularly endearing. The Shawk leaves a silent wake.

I was able to borrow the Shawk while I was doing the layout for my last EV book in a remote area of Oregon. I rode it daily to explore the back country. It was recharged from two solar modules.

Do-it-yourself'ers with the confidence to tackle the conversion of a motorcycle to electric propulsion should check out motorcycle wrecking yards in larger towns and cities for candidate vehicles. Or run an ad, offering a sum (25 bucks? 50 bucks?) for that dusty motorcycle stashed away in a garage somewhere. Some parent may want an old project motorcycle to quietly disappear. Be discriminating. You don't want to do a restoration. Also, as with an ATV, there's limited space in a motorcycle frame for batteries and motor. A small motorcycle using a 1 HP PM motor (\$200) and controller (\$200) will only need two 12V, deep-cycle batteries to make a good road or off-road machine.

Electric speedster

In the hope of building a competitive entry in the solar car races in 1990, Michael Leeds of Santa Cruz, California built a three-wheel test mule using off-the-shelf and affordable components and lead-acid batteries. The Speedster is an excellent example of the benefit of thinking light. With only six 12V batteries (72V of battery pack), a 4.5 HP series motor, and a single-ratio rear drive, the 600-lb speedster is "brisk" from a standstill and quickly reaches a 50 mph top speed. With the help of Dick Rahders, the vehicle created a new class of highway-legal EV in California, too.

The Speedster was a great demonstrator and a delight to experience, but it lacked room for a passenger. To let someone experience it, then, meant letting them drive it. The Speedster's

quiet elegance disguised its powerful acceleration, as many a novice discovered. Also, with its frame and suspension designed for solar racing, the Speedster was quickly becoming "thrashed" with street use and the antics of a large number of inexperienced drivers. The vehicle was fun, but it was clearly dangerous to use on the street. While the overall ergonometry of the vehicle was intuitive, it bump-steered (took another line when it hit a bump) because the steering system was worn. The Speedster lacked reverse (gear), real suspension and stable mirrors, and had no rollbar. Clearly, a major overhaul would be needed.

With these conditions in mind, I put together a project proposal to transform the Speedster for a new mission in life: safe for the street and able to carry a passenger. The proposal was accepted and, over the course of several months, the Speedster II evolved.

I had these observations and made these changes:

Rear Wheel Assembly: The moped rear wheel assembly was too small for a vehicle this fast and heavy. Frequent tire blowouts, a noticeable lean in turns, and the easy burn outs from a standstill suggested that something stronger was needed. I adapted a larger, huskier wheel/tire/rim from an Aurantetic motorcycle. The wider wheel could be run at lower tire pressure, softening up the otherwise unsuspended rear end. Also, the smaller overall diameter of the wheel decreased the drive ratio, too, minimizing the tire-spinning.

Front Suspension: The parallel A-arms (front wheel support) were designed for that of a solar racer, and too small for street use. The vehicle "bump-steered." Increasing wheel castor eliminated some of this. Nevertheless, front wheel alignment constantly changed with use as the undersized components bent and flexed. (Replacement of these components was not funded.) I installed larger front spring-shocks. The old ones

were almost fully compressed for drivers weighing over 150 lbs. This relieved some of the stress on the lighter suspension components.

Rear seat: A rear seat was installed, providing a means to give rides to children and adults in an educational setting. The seatback was designed to pivot forward and lay flat against the seat bottom. This gave access to the battery charger and charging extension cord. It also improved the aerodynamics when no passenger was aboard and increased the cargo-carrying ability.

Battery Pack: The original 24C3 batteries were worn out. These were replaced with more robust 27TMH Trojan batteries and divided into two saddle packs. Mounted on (and secured to) extensions off the frame on either side, this arrangement created the rear passenger space. A plastic cover, removable for maintenance, was installed over each pack to keep curious fingers away from battery terminals.

Steering Support: The upper support for the vehicle's steering post—weakened and sloppy from the loads imposed on it—was replaced with a new one and structurally reinforced. A lock was installed on the lower steering support to keep the arm from popping out (as it did occasionally, turning a casual cruise into a steering adventure!).

Control panel: A control panel was built and positioned for better driver visibility and reach. Switches like run, horn, headlights, and turnsignals, originally mounted in the steering post upper support, were re-mounted on an aluminum panel. A reversing switch was added, all switches got labels, and indicator lights were added for night-time operation.

Emergency brake: An emergency brake, adapted from a 280ZX, was installed and connected to the rear wheel brake assembly.

Roll bar: A roll bar, fashioned from 2-inch muffler tubing, was added

to the vehicle. (Ugh. Stronger tubing is called for.)

Reversing circuit: An electrical reverse “gear” was added. I took a low-budget approach, using four 12V starter contactors, to reverse the field winding relative to the armature winding. This is essentially a double-pole, double-throw operation. (Another mistake. This was more time-consuming, and less safe and reliable, than if I had just budgeted for the \$175 to purchase and install a true reversing contactor.)

Miscellaneous: The vehicle was rewired, and many components relocated. I recessed and shock-mounted the headlight assembly to avoid the frequent damage it had sustained when the vehicle front end would tap something. The turn signals and brake light were made operational. I installed motorcycle tires on the front end. The front seat was redesigned for better ingress/egress and better back support. The charger was installed onboard. The hydraulic brake cylinder was overhauled and the disc brakes adjusted.

Wiring Diagram: Once I completed the vehicle rewiring, I drew up a complete wiring diagram for the vehicle from my sketches. I also drafted a system schematic. These would aid mechanics or electricians in future troubleshooting and repair.

Operations manual: I also put together an Operator’s Manual for the Speedster, listing location and function of all vehicle components. Besides helping the novice operator understand vehicle features, this manual is a good place to give appropriate warnings about the limits of vehicle operations.

Register, License, Insure: The Speedster is street and highway legal. Because it is a three-wheeler, it falls into the general classification of a motorcycle. (It is in a new class that is bigger than a motorized bicycle.) Like any motorcycle, it is expensive to have comprehensive or collision cov-

erage, unless a high deductible is taken. A relatively inexpensive insurance rate provides good liability coverage.

Helmet: The motorcycle classification means wearing a helmet. The roll bar and seat belt offset the need for a helmet but—the law is the law. Without engine noise, it is easier to hear other traffic even with a helmet.

Overall, the Speedster is a good draft of a street machine. However, the existing vehicle design was too lightweight in its basic construction to consider further improvement without major design changes. What’s the next evolutionary step? A scratchbuilt street machine (see sidebar). I estimate that a stronger vehicle would cost \$5K in parts and \$6K in labor (150 hours at \$40/hr) to construct.

SOURCES

Michael Hackleman, PO Box 327, Willits, CA 95490. Send SASE for publications list.

The New Electric Vehicles: A Clean and Quiet Revolution, Michael Hackleman, Home Power Publishing, 272 pages, \$25. Available from address above. The vehicles in this article are partial excerpts from this book.

Burden’s Surplus Center, 1000 W. “O” St., Lincoln, NB 68501. This is the old standby catalog if you want anything mechanical, hydraulic, electrical, and electronic. Switches, motors, generators, meters, relays, contactors, wire, vehicle accessories, pumps, blowers, lights, indicators, etc. Good prices. Just make certain you understand all the parameters for the devices listed.

C & H Sales Co., P.O. Box 5356, Pasadena, CA 91107-0356. This is a surplus catalog with particularly good deals on motors, NiCad batteries, miscellaneous meters, switches, lights, and blowers.

Comet Industries, 358 NW “F” St., Richmond, IN 47374. Source for a lightweight (7 lb) differential that will handle up to 20HP, for under \$50. Δ

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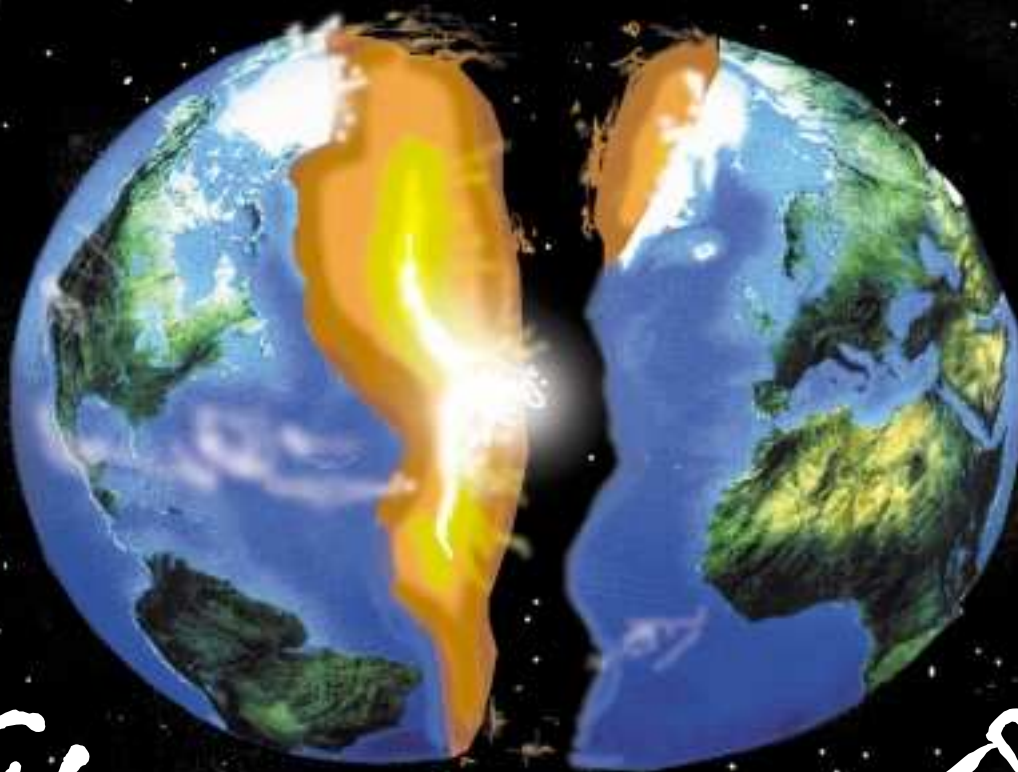
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The chances of



GLOBAL DISASTER

By John Silveira

We were preparing the current issue and the office hummed as it always does during deadline. Dave Duffy, the fellow who publishes this magazine, explained to our new artist what he wanted in a drawing; Mark Cogan, the fellow who does layout and has been changing the look of the magazine, was setting the cover; I was reading yet another submission fraught with predictions of dire catastrophes that lay in wait for us.

Off in the corner sat O.E. MacDougal, hunter, fisher, and poker player extraordinaire, looking like a bum in his tattered jeans and sweat-shirt with his feet propped up on a desk as he disassembled a fishing reel he'd picked up at a local garage sale. He'd come up from southern California for another visit and to do some fishing before the steelhead run ended.

I don't know what to make of the doom and gloom scenarios that come in the mail from various writers. I'm not sure I'm really qualified to evaluate them. I was reading one such article and stopped for a few moments to watch Mac fiddle with the gears inside the reel.

Y2K

Suddenly I asked, "Mac, what do you think of this Y2K thing?"

He looked at me curiously and I realized I hadn't asked the question right.

"What kind of effects do you think it's going to have?" I asked.

"It's already having effects. People are rewriting and redesigning software, replacing computer chips..."

"I mean, do you expect it to be a disaster or, as some people put it, do you expect it to bring about 'the end of the world as we know it?'"

He shook his head. "I think it's a tempest in a teapot. I don't think most people are going to have their lives



John Silveira

seriously disrupted by it. I believe at worst its effects will be about the same as what we'd have with a really bad winter. There'll be inconveniences and there will even be some fatalities attributed to it, just like a bad winter. There may even be power outages here and there, but nothing long lasting, and I don't expect most people to be affected by it very much or for very long. There will be production problems as some companies have short-term trouble getting supplies, but it won't be anything we haven't seen before that was caused by strikes or bad weather. And, in the meantime, there will be patches and work-arounds to solve the problems that do arise."

"Aren't you the optimist," I said.

"Many large businesses were 'Y2K compliant,' to some extent, before the end of 1998 and the ones that aren't are getting there. Wall Street already is; the New York Stock Exchange ran its tests sometime before the summer of '98."

"What about the government," I started to say. "I've heard..."

"Government is in trouble, but government's not part of the production

of wealth in this country. It's a consumer—and not a very efficient consumer at that. So if they have trouble collecting and spending money, we may actually benefit. The usual government victims—the poor and others dependent on government—may be hurt temporarily, but they're not part of the production of wealth either. If you'll recall, when the government 'shut down' a few years ago, during the confrontation between the Republican-controlled Congress and the White House, the economy didn't notice it a bit."

"Companies, on the other hand, are run by guys who want to ensure a profit, so many corporations are not only working to solve the Y2K problems that might arise, they're preparing to lay in a few weeks of inventory, just in case there are disruptions in supply. That in itself will ensure most production will continue while the problems that do arise with the supply system are dealt with."

"You certainly don't have a doomsday attitude," Dave said. I hadn't realized he was listening.

"Overall, life will just go on and it'll fade into history like the influenza epidemic of 1918 and 1919," Mac added.

The 1918 influenza

"What's an epidemic got to do with anything?" I asked.

"I was trying to compare it to another major disaster out of this century that didn't have lasting effects. That epidemic was worse than anything I expect the Y2K bug to be; businesses were temporarily shut down and, in some companies, key employees died. But civilization went on."

"I've heard of that epidemic," Mark said. He'd stopped working on his computer and turned to face Mac.

"In absolute numbers it was the biggest epidemic in history," Mac continued. "More people died of it than died in all of World War I. It also killed more people than any other

plague in history, including the Black Death that was the scourge of Europe. There were 30 million or more deaths in a year, including more than half a million in the United States where the epidemic began. That amounted to more than one and a half percent of the entire earth's population dead in about 12 months. And death came quickly. Many got the flu one day and two days later they were gone.

"Only World War II accounted for more deaths than the epidemic of 1918-19. Yet, life went on. Business went on. It didn't cause the stock market to crash or civilization to falter despite it being one of the greatest catastrophes in history."

"What's your point?" Dave asked.

"That major disasters don't necessarily have far-reaching effects, and I think Y2K is among them."

"Do you think there are preparations people should make for Y2K?" I asked. "Just in case?" I added.

"Anyone who's living a self-reliant lifestyle has a pretty good chance of surviving most of what life throws at us, including Y2K and even if it amounts to more than I think it will."

"So you're saying, prepare yourself with a self-reliant lifestyle and you can survive just about anything," I said.

"I'm not saying it'll guarantee survival, but it gives you your best chances."

Categorizing disasters

"What do you think the chances are of someone's life being seriously disrupted by a catastrophe?"

"Pretty good. When taken individually, any one disaster may be unlikely, but life is full of things that can go wrong, and when you add together all of them it's likely that one or more will disrupt your life—eventually. But for most of these disasters, the preparation will be the same whether they're personal, local, national, or global."

"Why do you separate disasters into different categories?" Dave asked.

"It makes sense to."

"Can you give us examples of each type?"

"Sure. But keep in mind that at each level there's bound to be some overlap. For example, a terrorist attack with a nuclear device would be a local event with national and global consequences."

"Okay," Dave said.

"Then let's start with the personal level. There are long-term sicknesses like cancer, heart disease, or injury;

"Mount Tambora...erupted in 1815 and is the greatest single volcanic event in recorded history. Its explosion threw so much material into the atmosphere that...it changed the climate of the entire planet. 1816 became known as 'the year without summer' and that year it snowed in June in the United States and Europe."

loss of your job; a death in the family; lawsuits; and stuff like that. If you've saved money, laid in food, and generally live a self-reliant lifestyle, you should be able to survive these. Maybe not comfortably, but you can save yourself from ruin, and life will go on.

"On the local level there are hurricanes, tornados, blizzards, earthquakes, forest fires, tsunamis, and urban riots, among other things, that can come and go. If you're not killed outright, a self-reliant lifestyle can ensure you come through any of these unscathed unless you're directly in the path of flood waters or a tornado or such."

"I understand," I said. "Food, water, toilet paper, a way to keep warm, a way to protect yourself..."

"A medical kit, a battery or solar powered radio..." Mac added.

"Yeah," I said, "stuff like that would help you through."

"It's the stuff you guys write about," he said.

"But you can't wait for a disaster to become self-reliant," Dave said.

"That's right," Mac said. "And, if you're prepared for those first two kinds of disasters, I think it's about all that's needed for Y2K."

"And on a national level?" Dave asked.

"On the national level there's political upheaval, revolution, recession, depression, etc. But being prepared for these things gets a little more ticklish. For one thing, you may have to prepare for the long haul. For another, a lot of people around you are going to be hurting, and if things really go down the tube for a long period, there's always the chance that your neighbors or, more likely, the authorities, will come to your house and take what you have."

"What's the defense against that?" I asked. "Guns?"

"You're not going to hold off the local police, the National Guard, or even a bunch of hungry neighbors for very long. Although I think you should have guns, your best defense is isolation, particularly in a small community where the people live self-reliant lifestyles anyway."

"I wouldn't want to be living in L.A. when the food ran out," Dave said.

"I wouldn't want to be close to any urban environment," Mac said. "Particularly if it became known that I'd taken steps to take care of myself and that I had a full pantry."

"What about globally?" I asked.

"Ahhh...", Mac said and a smile crossed his face. "It's at the global level where things start to get interesting—start getting to be fun. Why worry about California slipping into the ocean when you can dwell on the end of the world?"

"What do you mean?" I asked.

"Everybody loves a good disaster scenario. Look at all the calamities coming down the pike; it's a doom-sayers delight. Y2K predictions started in 1997 and continue through the

turn of the century, though with each significant date that passes, nothing really significant has happened. But we've got some good ones this year—like April 1st, when New York state, Canada, and Japan start their fiscal years 2000; July 1st, when 46 other states do the same thing; and October 1st, when the Federal Government does. The watershed date is supposed to be January 1, 2000, but we're told there are dates to watch out for that reach to at least the year 2004."

"And you still think that in all probability it's going to be no worse than a bad winter."

"I may be wrong, but that's what I think."

Dave and I looked at each other.

"But," Mac continued, "if you want something to worry about, consider this, on May 5, 2000, there'll be a lining up of the planets and civilization will be destroyed by worldwide earthquakes and volcanos."

"Is that really going to happen?" I asked incredulously.

"The lining up of the planets? Not really. The end of the world? Not this way. But there are plenty of people cashing in on it. In fact, if it weren't for Y2K you'd be hearing a lot more about it.

"But Y2K is everybody's dream catastrophe. It transcends political, religious, and economic boundaries. Conservative and liberal, believer and heretic, rich and poor love this one. The only people who don't believe in it are Hollywooders."

"Why not them?"

"When is a comet going to hit the earth? When is a plague going to wipe out a major portion of humanity? When are aliens going to take over the world? Each could happen anytime. So, you make a movie and you can show it for years. But Y2K is date-oriented. No one will buy post-2000 rights to a Y2K flick if it fizzles."

"So, that's it for global catastrophes?" Dave asked.

Global warming

"Oh, no, there are even more spectacular global calamities for those who want to worry. Global warming is one. This is the environmentalists' favorite global catastrophe. The scenario is that somewhere in the next century global warming will reach a fever pitch and we'll have flooding of all the coastal cities, the American heartland will turn into a desert, and most of the earth's species will become extinct.

"If the world really is heating up—and there's no clear evidence that it is—there is no clear evidence that a warmer earth would be a bad thing. We know that in the past the world has been warmer than it is right now and survived just fine. But none of this stops us from worrying about it."

"What's the real danger?" I asked.

Nuclear war

"If you're not scared by global warming, there's global annihilation through nuclear war. Even with the Cold War over, all it would take would be a few major political upheavals and who knows what the Russians or Chinese might do next? Why, just get some nut in the White House and we may start World War III ourselves. But we don't have to discuss the effects of nuclear war. We had that tune played for us for 50 years and if you didn't hear it then, I'm not going to sing it to you now."

"What else is there?" Dave asked.

Worldwide plague

"More intriguing is the possibility of a worldwide plague. It may be that the only reason Europeans got a foothold in the New World was because plagues of smallpox, measles, tuberculosis, and other Old World diseases, to which Europeans had some resistance, spread like wildfire through populations that had no resistance. It's unlikely that Cortez and a band of a

...the latest interpretation of the geological evidence now says that an ice age will probably come like a punch. Apparently, when the last glacial period started, lakes in Europe froze from top to bottom in less than three years and the islands that make up the United Kingdom and Ireland were covered with ice over 100-feet thick in less than a century.

few hundred men defeated the entire Aztec Empire. More likely, the entire population on two continents fell victim to catastrophic plagues that ran rampant, and the Europeans stepped in to fill the vacuum."

"Is there historic evidence to support that?" Dave asked.

"Yes."

"So, by inference, it could happen again, but this time the whole world would be subject to it," Dave said.

"Today," Mac said, "we may be faced by germs and viruses that are mutating and, at the same time, becoming resistant to antibiotics. Virulent microbes, natural or engineered, could even be unleashed in a terrorist attack or during a war between Third World countries. Biological weapons containing anthrax, smallpox, bubonic plague, and the like have been called the 'poor man's atom bomb.'

"Imagine a plague that sweeps the world like the Influenza Epidemic of 1918-19, but spreads faster and kills the infected more quickly—and there are no antibiotics, no vaccines. Influenza, AIDS, and many other historically common diseases—or even more exotic microbes such as the ebola virus, which is 50-90 percent fatal—are candidates for a plague of biblical proportions if they mutated in just the right way and got a chance to spread. With today's rapid air travel, a worldwide plague could spread before we knew what hit us."

"Is there a danger of the virus that caused the epidemic in 1918 and '19 coming back?" Dave asked.

"No one knows. But there's concern about it. Recently scientists exhumed bodies of some of the victims of that epidemic so they could study the DNA of the virus."

"Why?" Dave asked.

"They're hoping they can find a clue as to what made it so deadly, what it would take to make a vaccine against it, and perhaps even get a clue as to whether today's viruses are mutating in that direction."

"Is there any way someone can prepare for a plague?" I asked.

"Isolation in a rural community would help, and the more isolated, the better. But it's not a guarantee."

"Do you think it's going to happen?" Dave asked.

"There's just a probability that it can. But it would be hazardous to venture a guess just what that probability is."

"Is this the end of the global threats?" I asked.

Volcanism

"I'm just getting warmed up," he said, and Mark laughed again. "A more immediate concern is a massive eruption of a volcano that changes the earth's climate."

"That sounds improbable," Mark said. "Where's the evidence that that can happen?"

"Mount Tambora, which is on the Indonesian island of Sumbawa, erupted in 1815 and is the greatest single volcanic event in recorded history. Its explosion threw so much material into the atmosphere that as it spread around the world it changed the climate of the entire planet. 1816 became known as 'the year without summer' and that year it snowed in June in the United States and Europe. Crops failed, there was starvation, people lost their farms, and it touched off the wave of emigration that led to the settlement of what is now the American

Midwest. In the meantime, hundreds of thousands more starved around the world.

"There's also geological evidence of even more massive eruptions in the past. Two million years ago, eruptions in what is now Yellowstone Park expelled as much as 30 times what Tambora did. An eruption like that today would bring modern agriculture to its knees, and hundreds of millions—perhaps billions—would starve to death.

"Crater Lake, here in Oregon, which graces the pages of many calendars, rests atop Mt. Mazama. The six-mile wide crater, which forms the lake, was created some 6,600 years ago in one massive eruption.

"The fossil remains of an entire herd of bison was recently found in Nebraska, some 1,500 miles from Mt. Mazama, and some scientists believe that the entire herd was quick frozen by the gasses and debris from Mt. Mazama that rose to the edge of space, then fell to earth half a continent away and froze the herd to death before burying their carcasses under ash."

"You're kidding," Mark said.

"It's just a theory but it shows the incredible power scientists believe volcanos can unleash, and an eruption of that size today would be a civilization-altering event."

"How often do volcanos like that erupt?" Dave asked.

"Volcanos like Tambora are thought to happen once every thousand years or so. The ones like those in Yellowstone about every 10,000 to 100,000 years. The larger the eruptions, the less frequently they happen. But the next one may be right around the corner."

A new Ice Age

"Well, is that it for disasters?" Mark asked.

"No. There's another that may be a real concern for civilization because scientists think *it's going to happen*,

In absolute numbers [the influenza epidemic of 1918-19] was the biggest epidemic in history...More people died of it than died in all of World War I. It also killed more people than any other plague in history, including the Black Death that was the scourge of Europe.

but they haven't the foggiest idea as to whether it'll start tomorrow or 10,000 years from now."

"What's that?" Dave asked.

"The commencement of another ice age."

"An ice age? Are you crazy?" I asked.

"I'll bet not one person in fifty realizes that many scientists feel we're living in a glacial age. There have been something like eight ice ages—climatologists call them glaciations—in just the last three quarters of a million years. In that time, a good portion of the northern and southern hemispheres were covered with ice for 70 to 100 thousand years. Between each of these glaciations there's a warm period of 10 to 20 thousand years before a new one starts. We're in one of those warm periods, now, but unless someone can come up with a reason why there will never be another one, we're due for the next one and it may start tomorrow. Then again, it may be centuries, or maybe we may never see another one again—no one knows. But I think it's safe to bet another one's coming and civilization will have to deal with it."

"What causes them?" I asked.

"No one knows, though there's no shortage of theories including perturbations in the earth's orbit as it goes around the sun, changes in ocean currents, space debris blocking sunlight, volcanic ash blocking sunlight...the list just goes on and on.

"But the bad news is that years ago, it was assumed that the beginning of an ice age, as well as its end, hap-

About every 10 years bodies about 30 feet wide hit the earth. Most of them fall into the ocean...and some of them release as much or more energy than a Hiroshima-sized nuclear bomb.

pened over centuries so that if one started now, we'd have generations to prepare. But the latest interpretation of the geological evidence now says that an ice age will probably come like a punch. Apparently, when the last glacial period started, lakes in Europe froze from top to bottom in less than three years and the islands that make up the United Kingdom and Ireland were covered with ice over 100-feet thick in less than a century.

"To compound the mystery, available evidence says the glaciations end as abruptly as they begin and the last one may have ended in as little as three or four years."

"How fast would we have to react if an ice age started now?" Mark asked.

"If glaciation begins as fast as it appears they do, snowfall will accumulate faster than it can melt, piling up in thick sheets that will turn to ice under the compression of the snow that accumulates on top. Within 20 years ice sheets will cover a great deal of North America, northern Europe, and Asia."

"That's where the industrial countries are," Dave said.

"That's right. Eventually the ice sheets will be over a mile thick, burying all the northern cities. And when they begin to move, they'll sweep away everything in their paths."

"Listen to this guy," Mark laughed, "he's a regular doomsday machine."

Mac smiled again. "These most recent ice ages aren't even the worst that can happen. If we go through what the world went through 570 million years ago, when glaciers covered the earth as far south as the equator, almost every trace of civilization

would disappear and conceivably mankind with it."

Cosmic impact

"Is that the worst catastrophe we can expect, Mr. Doomsday?" Mark asked, and Mac laughed.

"No, the new favorite of almost everybody, and I'm among them, is collision with a celestial body."

"You mean comets and asteroids?" I asked.

"Yes. On the scale of disasters, these are the granddaddies, the ones that could really end the world. But, if it's any consolation, there's probably nothing to worry about for at least 18 months."

"What's so significant about 18 months?" Dave asked.

"There are two types of cosmic bodies that are candidates for such a catastrophe," Mac said, "asteroids and comets. We know the orbits of all the earth-crossing asteroids—the astronomers call them Apollo objects—as well as the orbits of the short-period comets—the ones that reappear frequently."

"What do you mean, 'cross the earth's orbit?'" Dave asked.

"I mean that the earth moves in an orbit around the sun and so do the other bodies in the solar system, and if another object's orbit intersects ours, it's possible that one day it'll collide with us."

"But because we know their orbits, we know that none of the really big asteroids or any of the short-period comets are threats to us in the foreseeable future. Long period comets are another matter. They're the ones that we see so infrequently, or have never seen before, so we don't know when or where they're going to sweep through the solar system."

"If we had five years of warning that one of these was going to hit the earth, there's probably nothing we could do about it. Not now, anyway. In a few decades that will probably change. But we wouldn't have five years,

because we can't even detect them until they're about 18 months out. So, if we saw one today, we'd just be doomed."

I don't know what kind of expression I wore when I heard this, but Dave and Mark took a look at me and laughed.

"But in those movies, *Deep Impact* and *Armageddon*, they send the Space Shuttle up and intercept them," I said.

"That's the movies. I doubt real life would resemble them in any way."

"But it's worse than that. There are comets and asteroids that are essentially invisible. The comets we see, we see because each time they drop back deep into the solar system the heat of the sun evaporates frozen gasses off them. That's how the tail of a comet is formed and it's all we actually see when we see one—we don't see the comet itself. But how many passes can a comet make before all the gasses have evaporated and it becomes invisible to us? If one without a tail was coming, we just wouldn't see it until, maybe, a few days before it hit. Maybe not even then. There's no way we could make preparations for that."

"Worse yet, there are asteroids whose orbits keep them between us and the sun all of the time. They're called Aten asteroids and, because of the glare of the sun, we can't see them. If one of them came close enough to Venus to have its orbit disturbed, it could be earth bound and we'd never see it until it was coming through the atmosphere. According to astronomers there are probably more than 150 of these that are a half mile wide or larger, and there's another 50,000 or so that are bigger than a football field."

"I'm confused," I said. "Is there anything to worry about or not?"

"There's always stuff to worry about." Mac said.

"I love this stuff," Mark said and he looked at me and snickered again.

"You're sick," I said and all three of them laughed.

"But really," I asked Mac, "what are the real concerns and what's just smoke?"

The realities

He let out a long breath. "Let's get rid of some of the easy ones first," he said. "First of all, on May 5, 2000 the planets are not really going to all line up in a row like billiard balls in some macabre cosmic pool table trick, though that's the way artists want to draw it. Eight of the planets, including the earth, will be in the same quadrant around the sun but not in a line. Second, even if they were lined up perfectly there isn't a physicist or mathematician who's done the math who has concluded that there's even a remote danger from the combined gravitational tugging. These predictions of terrestrial disasters that result from some configuration of the planets have been with us for centuries. The earliest ones I remember were when I was a kid and there were predictions of worldwide earthquakes, worldwide tidal waves, and that California was going to fall into the ocean. It didn't happen. If I'm going to worry about it, I'm going to wait until the guys at CalTech tell me to worry, not when some astrologer, soothsayer, or new-ager tells me to, and the guys at CalTech aren't alarmed at all.

"Next disaster: we're going to know about Y2K real soon. It'll be boom or bust. And while admitting that I may be wrong, my personal prediction is that the biggest calamity out of this is that, when nothing happens, the doomsayers will have to go out and get real jobs. Of course, some of them are so talented that they'll always find a new catastrophe to sell.

"And concerning the ice age, I think that one will happen again. But we know so little about what causes them that there's no way to predict when one's going to start. If it happens, it'll just catch us by surprise.

"I wouldn't want to be living in L.A. when the food ran out," Dave said.

"I wouldn't want to be close to any urban environment," Mac said.

Size matters

"As far as asteroids and comets go, there are millions and millions of them no bigger than boulders and some enter the earth's atmosphere as meteors and never reach the ground. Our concern is with the larger ones.

"There are at least 250 that have diameters of 60 miles or more including the two largest, Ceres, which has a diameter of 581 miles, and Pallas, which is 332 miles in diameter. If any one of those were to hit the earth, not even bugs and bacteria would survive."

"Do those ever hit?" I asked.

"The moon, Mercury, Venus, Mars, and most of the satellites of the outer planets all bear evidence of past impacts by bodies, any one of which would end the human race if one of similar size were to hit the earth now."

"Are the big ones the only ones that are dangerous?" Dave asked.

"When talking about these objects it's important to distinguish between objects made of stone and metal, like the asteroids and burnt out comets, and those that are primarily frozen gasses and water.

"If we consider the first kind—the stone and metal ones—every year an average of one small asteroid or comet, exploding with the force of a 100-kiloton bomb or greater, explodes in our atmosphere. Most of them are so far out at sea, or are so high in the atmosphere, that they aren't observed by civilization.

"About every 10 years bodies about 30 feet wide hit the earth. Most of them fall into the ocean—because there is so much ocean—and some of them release as much or more energy than a Hiroshima-sized nuclear bomb.

"A body 300 feet across has about 1,000 times more mass than one that's 30 feet across. The largest nuclear device ever detonated, one by the Soviets, was a 54-megaton device; a 300-foot object would probably have twice the explosive force of such a bomb. Big, but still just a local event.

"The Tunguska event, which was an asteroid or comet hitting in Siberia in 1908, is one of the most recent events in which a large cosmic body hit the earth. Relatively speaking, it wasn't really a significant event in the earth's history and it was without global consequences. It was probably 200-foot across and hit the atmosphere and exploded before reaching the ground. The explosion was like an airburst of a 20 to 100-megaton hydrogen bomb. In other words, it was at least 1,000 times as powerful as the atomic bomb dropped on Hiroshima. Such an object would be catastrophic if it hit over a major city. Literally millions would die instantly.

"Objects as big across as a football field, and on upwards to a half mile across, probably hit about once every 5,000 years. An object that big would leave a significant crater—probably two miles across—and cause massive destruction for miles around, but its effects would still be primarily local.

"But once you reach the upper end of those size bodies, say a half mile across, you're talking about objects that would destroy most countries and cause short-term changes in the world's climate.

"Of the asteroids that cross the earth's orbit, the Apollo asteroids, there have been a little more than 100 identified that are over a half mile wide, and it's estimated that there are probably another thousand we haven't seen yet."

"And a really huge one could," Dave said.

"Objects a half mile across or larger probably hit every 300,000 years. Now we are talking about an object that would kick so much dust into the air that their effects would be felt all

over the world. With the dust cutting down the amount of sun reaching the earth's surface, there would be crop failures of biblical proportions and billions would die of starvation.

"Astronomers estimate that mile-wide asteroids hit the earth every million years or so. If one hit today, it would disrupt weather on a worldwide basis. Civilization wouldn't end, but it would be sent reeling for years, if not decades.

"Such a body hitting the ocean would create tidal waves that would wipe out all coastal cities bordering that ocean.

"However, the same sized objects, if they are comets composed mostly of water and frozen gasses, are not likely to even reach the surface. They'll break up in a massive explosion. The damage they do will be mostly local, like detonation of a huge hydrogen bomb at high altitude.

"An object larger than 2.5 miles across probably hits about every 10 to 30 million years. In such an event the world's agricultural base would be so severely shaken that at least a quarter of humanity would die within a year and perhaps half of us would die before the climate returned to 'normal.'"

The end of civilization

"How big was the one that wiped out the dinosaurs?" Dave asked.

"That's one to write home about. It was probably about six-miles across."

"What would happen if one of those big ones hit?" Dave asked.

"The end would come like this: One second the skies are blue, the birds are singing, children are playing, lovers embracing, people are doing their jobs...and the next day civilization is over."

"But how?"

"First, the local explosion would annihilate everything nearby and there would be a shock wave that would radiate out killing everything for hundreds of miles. Fire storms would

radiate out for as much as 500 miles. Then there would be an enormous amount of material that would be blasted into the air and it would come down all over the earth creating a global firestorm. On top of that, the energy released may raise most of the earth's surface temperature to oven-like temperatures.

"However, some paleontologists and geologists think volcanism, not cosmic impact, may have led to the demise of the dinosaurs. And there's evidence that the Deccan Traps in India, which are the result of some of the largest volcanic outpourings of magma in the earth's history, were responsible for changing the earth's climate so much that the Cretaceous extinctions occurred. Similarly, at the end of the Permian, 250 million years ago, 96 percent of all species became extinct when the Siberian Traps were formed by even greater volcanism. And, in part, the scientists who believe it was volcanic eruptions may be right.

"But those who back the impact theory believe that shock waves traveling through the earth may also spur widespread volcanic activity. And coupled with this is that the explosion at the impact site would throw so much dust up into the atmosphere that this dust would girdle the earth and plunge it into darkness. Temperatures would fall and photosynthesis would stop. Seeds would make it through such an event, so the world would soon be repopulated by the same plants. And quite a bit of sea life would make it, but it's likely that no land animal larger than a cat survived the event that killed the dinosaurs, so there's no reason to believe that any would now—with the exception of some humans. But even that's not certain. Somehow, some birds made it through, and some amphibious creature such as alligators and crocodiles made it too. Crocs and gators may have made it because their food requirements are lower as they are cold blooded, and because they could

scavenge on the bodies of the dead, but I'm not sure if anyone has a clue as to how birds did it.

"Such an object hitting today would end civilization. Conceivably no one would survive. Though, then again, there are so many people, and we are spread out so widely around the planet, that some might pull through and emerge into a post-collision world in which the world would be a virtual desert."

"How would you expect humans to survive what killed the dinosaurs?" Dave asked.

"No dinosaur put up canned goods, laid in sacks of grain, or ensured a viable water supply. If any organism can make it through a few months, maybe a year or so, they have a chance. Some people could conceivably make it."

"Where would be the best place to live in anticipation of something like that?" Dave asked.

Mac looked at the ceiling for a few seconds. He looked back at Dave. "I don't know. I'd say a small community. But it would depend heavily on where the object hit. I wouldn't want to be too close to any ocean because of tidal waves. There would be worldwide earthquakes and worldwide tidal waves, perhaps even volcanic activity would be accelerated by a large collision. But...I wouldn't know how to pick a place."

"So it's a threat," I said.

"Some scientists feel that within our lifetimes there's roughly a 1 in 10,000 chance that a cosmic body that would bring about worldwide crop failures and end civilization can occur. So the likelihood of an impact in the near future is extremely remote, but, if it happens it is quite possible mankind will become extinct.

"But my guess is, if civilization can last another century, with the current rate of technological progress, one day any asteroids or comets that pose a threat to us will be detected and dealt with. Barring a technological implosion, the kind some back to earth-

types want, it is only for the the next few decades that we're at risk.

"Are these estimates of possible impacts accurate?" Dave asked.

"I don't know because every time a new estimate is made of how frequently large bodies collide with the earth and release energy in the nuclear bomb range, the estimated frequency goes up."

"Why?" I asked.

"More data is discovered."

"So," Dave said, "if I asked you these same questions five years from now, you'd probably paint a bleaker picture."

"Good chance of it."

"I'm sure of that," Mark laughed.

Mathematical odds

"So what is the mathematical probability that a major event will disrupt our lives?" Dave asked.

"To make an estimate, you have to decide what time range you want to consider: the next year, the next decade, the rest of your life—however long that is.

"You've also got to decide what scenarios you want to include. If you're including things on a personal level, it's almost certain that your life is going to be disrupted before you die.

"If you're including local catastrophes, it depends on where you live. For example, you're not going to worry about tidal waves in Nebraska or blizzards in Hawaii, and though earthquakes can occur in Boston, they're more frequent in L.A.

"Every place has its dangers, you just have to assess them. But it's probably reasonable to assume that no matter where you live to 75 years of age, you'll probably see at least one local event like a big earthquake, a major hurricane, or flooding like the midwest had a few years ago, and many people will see several."

"Then let's take the big ones," Dave said. "What are the chances that someone's life will be disrupted by global calamity? Can you figure that?"

"We can guess at it. First we have to decide what to include, what period of time we're considering, and then we have to ascribe a probability of each causing a problem."

"Figure the next 40 years," Dave said.

Mac took a piece of paper and made a list. For a few minutes we tried to come up with the probability of each event on his list happening. Among our figure was our guess of a 1 in 6 chance of a deadly epidemic and 1 in 25 chance of a climate altering volcano. Mac also included another event we had-

n't discussed: global economic depression. Then he figured the probability of each event **not** happening. In other words if Y2K had a .05 chance of happening, it had a .95 chance of not happening. On the other hand, he said there was a zero chance of the planets lining up and causing a disruption, therefore, the chance of it not happening was certainty, or 1. (See the table.) Then he multiplied all the chances of these things not happening and subtracted that answer from 1 and what was left was the chance that at least one of the events would happen in the next 40 years.

"With the guesses we've taken, the chances that at least one thing will disrupt our lives, on a global scale, over the next 40 years is about 45 percent. In other words, it's close to a 50-50 chance that hard times are in store for us at some time in the next 40 years."

"That's a lot more pessimistic than I would have said," Mark said.

"Me too," Dave joined.

They looked at me. "It's probably optimistic as far as John's concerned, Dave said and we all laughed including me.

Table of catastrophes

Event	Probability of disruption	Probability of not happening
Y2K	.05	.95
Planets lining up	0	1
Global warming	.1	.9
Nuclear war	.1	.9
Plague	.167	.833
Volcanism	.04	.96
Ice age	.006	.994
Cosmic impact	.005	.995
Global depression	.1	.9

Employing a standard method used in the mathematics of probability, Mac multiplied the figures in the last column together and got 0.547742996, which he rounded to 0.55-or 55%. Subtracting that from 100% left a 45% chance of at least one catastrophic event occurring in the next 40 years.

"You can vary these estimates and recalculate the overall chances," Mac said, "but don't be surprised if your answers look grim, no matter what. They probably reflect reality because in the 20th century alone we had a plague, a global depression, and the worst war ever fought. Though you may be faulted for it, it's reasonable to expect more disasters in the future."

"And self-reliance is a reasonable alternative," Dave said.

"And we've got a deadline to meet," Mark said.

"And I'm going fishing," Mac said as he reassembled the fishing reel.

And I turned around and started my column. Δ

**You can read other John
Silveira conversations
with O.E. MacDougal
online at the Backwoods
Home Magazine website.**

www.backwoodshome.com



Raising your own beef for your family

By Charles Sanders

For most homesteaders, the raising of livestock plays a crucial role in the home based economy. The types of livestock which you choose to include on your own place may be determined by your climate, the size of the homestead, food sources available, the available market (if you choose to sell some animals), and just your personal preference. It is sometimes argued that you can buy all of your meat—beef, chicken, pork, lamb, rabbit, etc.—far cheaper than you can raise it. While this may be true when speaking in terms of money alone, other factors must be considered when referring to meat raised for homestead use.

These days, red meat in general, and beef in particular, is continually

maligned as one of the greatest detriments to our health and well-being. I'm here to tell you that you can raise some mighty tasty and nutritious beef on your own place, and do so without a lot of the fat and chemicals which lace most commercially raised beef. Our own beef is raised mainly on grass and hay, with little grain or supplement. Free access to trace mineral and high-magnesium blocks, water, and pasture all help to turn out fine beef, much leaner than "store-bought" and at a competitive cost.

As one might expect, the first thing to consider when comparing home-raised versus store-bought meat is quality. Home-raised meat is born, raised, and processed with one thing in mind and that is to be used as food for the family. Generally speaking, commercially raised

livestock is also raised with one thing in mind, that being to produce the most marketable product in the quickest time at the lowest cost and highest profit to the producer. Somewhere in there, quality has to suffer. Those of us who raise our own meat know what is going into it in the way of feed and additives. While many of us occasionally must fall back on an application of medication, etc. to restore or maintain the health of an animal, we know that no massive doses of hormones or steroids have been pumped into our future dinner entrees.

Another factor worth serious consideration is this. In the event of a serious emergency—economic or otherwise—the livestock raiser would have a valuable potential food source available. Obviously, we cannot place such

reliance on our supermarkets or grocers. In hard times, grocery shelves and meat counters would likely be quickly depleted of their stock, leaving bewildered and dependent customers wondering what to do next.

If you have children in your family, the value and importance of having livestock on the homestead cannot be underestimated. Youngsters learn much by having animals around. The responsibility of having feeding to do, hay to help get in, manure to load into the spreader, and similar chores help a young person build self esteem and a good work ethic. A child can sense and build upon the feeling of contribution and importance in the family. He will learn that there are things which are expected of him and that his efforts are a valuable part of the family life. In doing this, we are helping to shape our youngsters into productive and responsible adults who are not afraid to work.

Children also learn the no-nonsense life-death cycle of animals which God put on earth for man to use wisely. A youngster growing up on a homestead which raises animals for food has no doubt about where his food comes from. Unlike many of his city-raised counterparts, he will develop a direct appreciation and respect for the life cycle of meat animals. Countless numbers of young people have learned the "facts of life" while observing animals on the farm and homestead. Many have even assisted parents in helping struggling animals in the miracle of birth. These youngsters, and their adults, develop a true respect for life and better understand the God-given miracles involved.

When getting into the cattle business, this may seem sort of obvious, but you should keep in mind the fact that cattle are BIG! An old beef cow can easily reach 1000-1200 pounds. Even the normally docile old animals can accidentally step on your foot, and if you get them excited or scared, they can seriously hurt or kill a person.

Our own experience with cattle has been interesting and educational, if not

extremely profitable from a dollars and cents point of view. Cattle on most small places can do little more than keep the place from growing up in weeds and providing butchering beef for yourselves and for sale. Small landholders should not expect to get rich on cattle. This thought is echoed by our veterinarian, who has stated to me that he doesn't see many small family herds of six or so cows with calves, make a real profit. But he adds, "A small herd like this will pay the property taxes and keep the pastures trimmed down."

In fact, it is possible to sell a few fat calves, young steers, or butchering beef and make the program pay for itself and perhaps pay the property taxes as well. In addition, they can help keep your place from growing up around your ears. Over the years, we have had cows, bulls, calves and steers. Having raised bucket calves and having kept cows with calves, I have developed some educated opinions about the two methods of raising beef.

Cattle breeds

What type of cattle do you want? First, there are basically two general types of cattle: dairy and beef types. Among the common dairy breeds are Jersey, Guernsey, Brown Swiss, and Holstein. Popular beef breeds include Angus, Hereford, as well as the more exotic Limousine, Semintal, Charolais, Saler, and a whole pasture full of other breeds. Dual-purpose breeds such as Milking Shorthorns exist, but are not really common anymore. They do offer possibilities for the homesteader, however.

Both beef and dairy cattle have been carefully bred over time to do the best at what they were bred to do, whether it is produce milk or meat. The dairy breeds are biologically and physically made up to produce milk. That is to say, they are bred to convert feed to milk and do not have the heavily muscled body that the stocky beef breeds have. The beef breeds do best at con-

verting feed into a meaty, heavily muscled carcass.

This is not to say that dairy calves cannot and should not be raised for beef. Countless ones have. Many a Jersey bull calf has been raised to become steaks and roasts. Often, however, when a homesteader breeds back the family milk cow to freshen, he chooses an Angus bull or other suitable smaller beef breed. This results in a renewed milk source and a good calf more suited to raising for meat since it will exhibit many of its Angus parent's characteristics. Breeding the Jersey cow to a smaller framed type bull will help ensure that the smaller cow will have an easy birthing.

I have been around cattle for many years, but had not raised what we refer to as "bucket calves" or "bottle calves." We started into this project by purchasing seven Holstein bottle calves from a local dairyman. In a dairy operation, the male calves are removed from the herd, whereas the heifer calves are kept and raised as milking herd replacements. At the time we bought ours, the going price in our area was about \$125 each. It is interesting to note that this past season, some of the neighboring dairy farmers were getting no more than \$30 a head. Some were actually giving them away after not getting bids for them at the local sale barn. They are usually sold as day-olds or at a few days old.

The folks we got ours from were very helpful and wanted to keep the calves for a full week to make sure they got off to a good start. They monitored them for scours—diarrhea which can kill a new calf in a matter of 24 hours or so if not treated. The week also allowed the calves to receive some new milk from the mother cow. That colostrum, the first rich milk, is important to the calves as it contains many of the anti-bodies and bacteria needed by the new calf to get off to a good start. Those same anti-bodies and bacteria help to prevent the scours mentioned above.

Our bull calves were raised on bottles with calf starter formula, adding some



Our boys feed a Holstein “bucket calf.” The bucket is specially made for calf feeding and has a large rubber nipple attached.

dry feed at a few weeks of age, and weaned off the formula entirely at about 10-12 weeks. The calf starter is available at any livestock supply store. The dry feed was custom blended at the local mill. The formula is nothing magical, just a blend of 500 lb. of ground corn, 50 lb. of calf supplement, 25 lb. of molasses feed, and 2 lb. of salt. This is a good basic growing ration. Once the animals reach about five or six hundred pounds, we switch from calf supplement to steer supplement; otherwise the formula is the same. Make sure that weaned calves have clean water available at all times. A large steer or cow will need about 12 gallons of fresh water per day.

Medical problems were not serious during these early weeks. A couple of the calves had a bout with scours, but with some simple medications they came out of it all right. If a young calf does get scours, it is imperative to get them off the calf formula and get some fluid and electrolyte replacement into them. We did learn that in a pinch, powdered Gatorade can serve as good an electrolyte replacement as the stuff that comes from the vet. It is mixed with water and given just like the stuff from the vet. Your own vet can advise

you on any potential problems which might be specific to your area.

We did not castrate the animals until they reached about 500 pounds. Our local veterinarian convinced us on this. He explained that the testes of the bull calves serve as natural hormone implants and cause the calf to grow faster during those first several months. Once they reached about 500 pounds, the vet was summoned and the calves were dehorned and castrated. This procedure is briefly painful, and the dehorning is somewhat bloody, but in a day or so, the event is seemingly forgotten and the animals are back to their routine. If you have purchased polled or hornless breeds of cattle, then obviously you will omit the dehorning procedure. Dehorning is not actually necessary, but it does help to prevent accidental injuries to the other cattle or to humans. The dehorned animals sell a little better on the market, as well. As for converting bull calves into steers, I recommend “cutting” as the best method. Other methods such as banding and clamping are effective if done properly, but this one is sure-fire. I also consider it healthier for the animal.

Since Holstein cattle are bred to produce milk and not beef, they seem to

spend the first year just developing their frame. Not until the second season do they seem to start to bulk up much. Even then, Holsteins don’t put on the muscle that the beef breeds do. They eventually do fill out well, however. On the other hand, Holstein beef is a rival to any in taste and texture. These big cattle do indeed produce some very tasty steaks, roasts, and burger.

As interesting and educational as raising the bucket calves was, I really prefer to just let the old cow raise the calf. Therefore, we currently have only beef-breed cows and calves on our place. These are good Angus-Hereford cross cows bred to an Angus-Saler bull. Some may ask about birthing or birthing problems. We have had dozens of calves born on our place, and I can think of only one loss. Just a few weeks ago, I was cutting firewood in a woodlot above one of our pastures and watched one of the old cows give birth. I have helped with a birthing or two, but even then, I don’t think I was really needed. As this is written, we have four new calves and should be getting a couple more any day. Problems are normally few with an arrangement like this, for in most cases, the cow is much better at raising the calf than a person is.

Hay

You will need to provide a source of hay for your animals. In most areas, most of us are able to allow the animals to graze during the summer months. In winter, however, hay must be provided. Here is a basic question: What is hay? Hay is simply grass that has been cut and cured for later use as food for animals. It is stored loose, in small square bales or in large round bales. Hay prices vary widely across the country. Around here, it is usually sold by the bale. In the west, hay is normally sold by the ton. Small square bales weighing about 50-75 pounds will normally run from \$1.00 to \$1.50 for mixed grass hay. Alfalfa can run up to \$3.00-5.00 per bale. Large bales come in many different sizes according to the make and

size of baler turning them out. The farmer can usually let you know the equivalent in square bales and base the price accordingly. As for loose hay, I can tell you that it is simply a lot of work. I don't know of anyone putting up loose hay other than the neighboring Amish farmers. Even many of them are switching to ground driven square balers pulled by their teams of husky horses.

Some time ago, I heard this question: Is hay the same as straw? No. Hay is an irreplaceable food source for our grazing animals, especially in winter. Straw is a by-product of the grain harvesting process. It is the stem and leaves of a grain stalk that is left behind after the seeds have been removed from the seed head by the harvesting equipment. Straw has no nutritive value; however, it is valuable as a bedding material. Wheat straw is the most common type of straw, but any of the cereal grains such as oats, barley, rye, etc. can yield good straw after harvesting.

A mature cow will need roughly a third to one-half a bale of hay per day during the winter or if on a site where pasture is not available. As I mentioned, we feed hay only during the winter, along with a bit of mixed grain feed.

Fencing

Good fences are necessary to keep cattle in. A cow or steer grazing indiscriminately through the neighborhood may or may not incur the wrath of the neighbors. But why take the chance? Chances are it wouldn't make you or the cattle too popular.

If using standard fencing, I recommend sturdy woven wire on stout posts. Woven wire comes in different heights, but I'd recommend the 39-inch. When putting up the woven fencing, allow a couple of inches extra at the bottom and top. After it is erected, stretch and add a strand of barbed wire on the bottom and the top along the entire length. Cattle will really stretch to get to tasty plants outside their fenced area. These



This holder was made from scrap wood and hardware. Feeding four hungry calves at one time can get pretty lively. Hang on!

strands of barbed wire will convince them not to stretch under or over the top of the woven wire and will save you much in the way of maintenance and repair.

Some sections of our fence is barbed wire only. I prefer to use four strands of barbed wire, but three will suffice in a pinch. If you can, use four. It just makes a tighter fence.

Electric fence will work in most cases. It also offers the option of being easily moveable to fresh pastures. Once the cattle are trained to recognize its ability to cause discomfort, you should have no problem. The so-called training is nothing more than simply allowing them to bump or brush the fence while grazing. We used a single strand of electrified barbed wire on one pasture, and it kept in four large steers without a single problem or escape.

Pasture

On good pasture, a couple of acres will maintain one animal. Naturally, in drier climes, more acreage per head is needed. Plant varieties for pasture vary from region to region. Local farmers and ranchers, as well as your local Agricultural Extension Service, can recommend types for your area. It is best if

you can rotate the animals out of one pasture and into another from time to time. This practice allows the pasture to rejuvenate its plant growth and allows any parasites to die off.

Shelter

Cattle need a draft-free yet not airtight shelter. I used to think that was a contradiction. However, realize that a good shed with three sides closed in and the open side facing out of the prevailing wind makes a good shelter. Do not make the shelter airtight. Cattle give off a lot of moisture, and if it cannot escape all kinds of health problems in your animals will result.

Shelter for your animals doesn't have to be anything fancy but it does need to be sturdy. These big animals stomping around can knock a lot of things loose if not secure.

Marketing your beef

Our Holsteins were kept for two full growing seasons. Five of the steers were trucked to the Louisville livestock market where they brought a pretty fair price. The other two were kept for later sale to friends. We were paid at the market price on the day they were taken

to slaughter. We could have easily advertised and gotten a higher price, but we were selling to friends, so the market price suited us.

Right now, we have beef-breed cattle running on our place—some Angus-Hereford crosses. They pretty well take care of themselves during the summer months and require just the normal feeding and watering during the winter. The Angus bloodlines mean smaller calves and easier births. Crossing the two types of cattle gives a good, vigorous animal with a solid, desirable shape and meaty carcass.

Another real possibility for the small farmer/homesteader is to sell to a select market. By raising your beef organically, that is with clean natural feeds and no additives or hormones, you will be ending up with a premium product which can command a high price if marketed properly. If, for example, you live near a medium to large urban center, people will be happy to pay more for your lean, farm raised beef. A small, inexpensive advertisement in the local newspaper or at a nearby health food store or co-op will usually result in all the customers you want. This will require diligence on the part of the raiser to assure that his stock receives the natural, additive-free feed which produces the higher priced beef.

Maybe you want to market locally. Even farmers and other country folks do not raise much of their own food these days. Advertise in the local paper and you will be surprised at the folks who are interested in buying good beef. If you have your own beef processed at a local meat processor, then you can offer to haul your customer's animal at the same time as an added sales pull. You will be able to get at least the going market price and usually a bit higher. You will be able to ask around at the local meat processor, farmers, and others who have a good idea what you can get for beef. If you can guarantee that your beef is "additive-free" or "organically raised," then you can get a better price yet. Just the fact that your beef is raised on a small homestead and not in

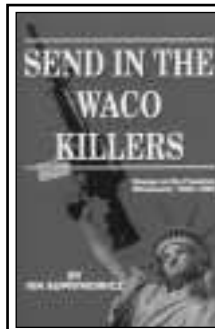
a "beef factory" feedlot means a lot in the way of producing clean, low- or non-medicated, additive-free beef. Our own beef is fed only grass and hay, with a smattering of grain during the winter months. We never confine our beef animal prior to slaughter for the purpose of "pouring the grain into it." In my experience, this does produce heavier cattle sooner, although I'm not sure the profit outweighs the cost of the extra grain. It also produces beef with a lot more fat on it throughout the meat. This "marbling," while desirable for "gourmet" cuts, is not really healthful. Our grass-fattened beef does us nicely, thank you.

So, if you are interested in picking up a calf or two to raise for your own use and possibly to sell to family or friends, then raising bottle calves may be the thing. Perhaps you would rather buy a mature bred cow or a cow and calf. Consider your alternatives and your resources to help decide the operation which is best suited for you. Whether you raise just one animal for your own consumption, or half a dozen to sell, you will be amply rewarded for your efforts.

For more information, look for these books. Some of them may be out of print, but patient and diligent searching have helped me add them to my shelf.

The Family Cow, by Dirk van Loon, Garden Way Publishing; Raising a Calf for Beef, by Phyllis Hobson, Garden Way Publishing; A Veterinary Guide for Animal Owners, by D.C. Spaulding, D.V.M., Rodale Press; The Stockman's Handbook, by M. E. Ensminger, Interstate Publishers; The Cow Economy, by Merrill and Joann Grohman, Coburn Farm Press. Δ

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SEND IN THE WACO KILLERS

Three times the International Society of Newspaper Editors has included Vin Suprynowicz in their list of the 12 top weekly editorial writers in North America. For years his shoot-from-the-hip style has opened the eyes of thousands to government abuse of our liberties. In this book, Send in the Waco Killers, he blends material taken from his syndicated column with new commentary to give the reader a detailed, reporter's-eye-view of how the rights and freedoms of Americans are being subverted.

He uses factual accounts from the daily news to show how the Feds use the drug war, the public schools, jury rights, property rights, the IRS, gun control, and anti-militia hysteria to increase its power and control over us. He details how agents of the ATF and FBI have routinely lied, how they use paid informants to infiltrate Constitutionally-protected militia groups, then fabricate evidence to get arrests and discredit them.

Had he lived 225 years ago he'd have written a book to detail how King George III and Parliament have tried to enslave us but, sadly, this book is about how our government today is depriving us of our freedoms and ruining the lives of thousands without changing even one word of our Constitution.

If you read no other book this year, read Send in the Waco Killers. Just keep your blood pressure medication handy. 506 pages, trade paperback, \$21.95 + \$3 S&H.

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Build a *REEL* toilet paper holder

BY D.J. FERDINAND

The cabin was made from small logs in stockade fashion. Each upright log ended in a tenon that fitted into a socket on the bigger sill log. The only nails used were holding the split shingles of the roof. The floor was made from rough sawn Douglas fir and the only part of the three room house that was not cedar.

It was a lovely and snug home on an excellent trout lake in northern California and it was all mine for the next seven days.

The outhouse stood 50 yards to the north in a grove of pines and was constructed in the same manner as the main house. Beside the outhouse a steel drum on a wooden tower provided water for hand washing. Very civilized.

What really caught my eye in this most comfortable privy was the holder

for the roll of toilet tissue. It was in the shape of a fishing reel, and the tissue peeled off its drum like line during the run of a big trout. It was made of fir, and varnished. The knob on the reel handle was made from a piece of cow horn.

It was love at first sight. I made a few sketches and resolved to make one as soon as I got back to my workshop. (See illustration.)

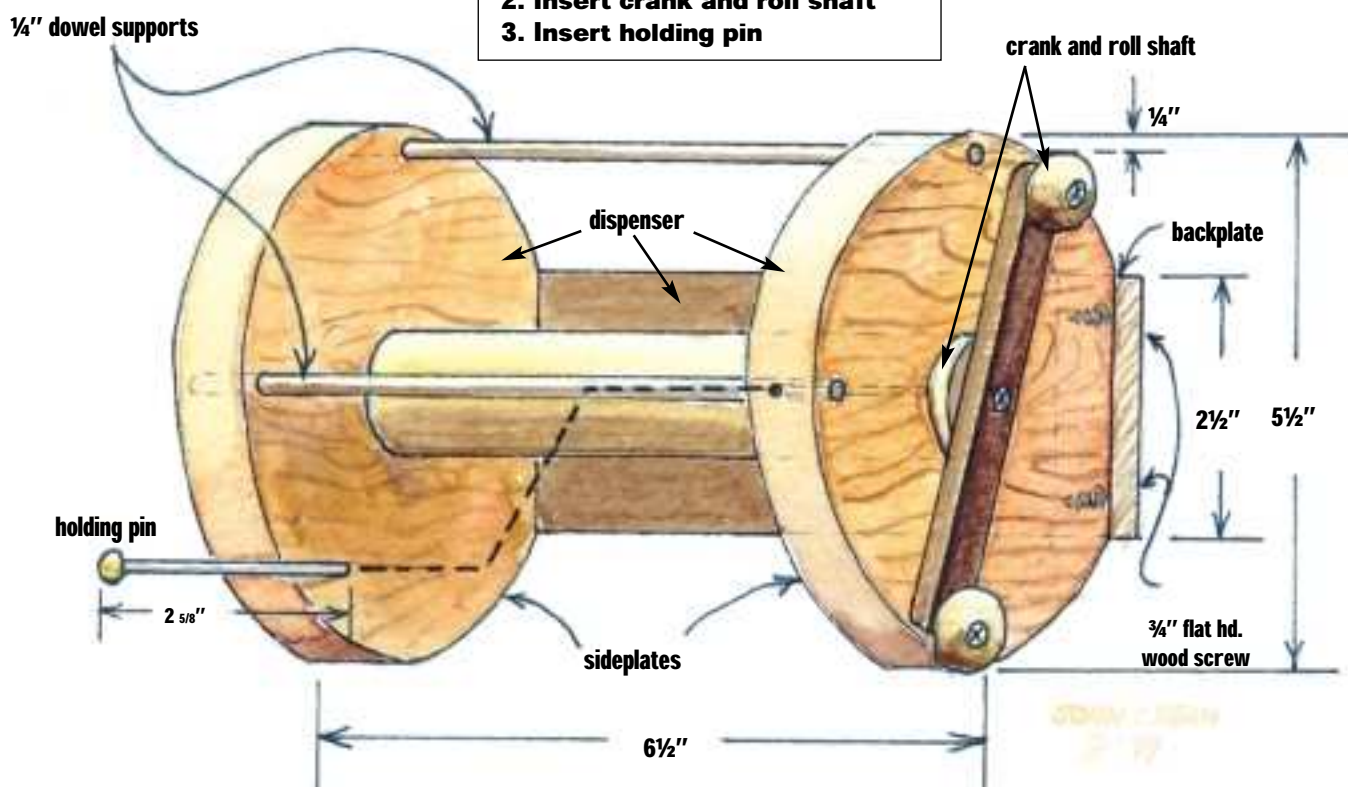
All parts were made with stock lumber. The side plates are cut from one by six clear dry fir. Their outside edges can be rounded to a ¼-inch radius with a router or left with a sanded edge. I used inch and a quarter dowel stock for the tissue roll spool; a hole saw made a perfect fit in the side plates.

The knob on the reel handle was made from a piece of small deer antler on my original. I am sure that any craft store would have a large selection of wooden beads that would work fine. The drawing shows beads made from the centers of the hole saw cuts. I like using a hole saw for this reason. I glued the plugs to a short length of ¼-inch dowel and chucked the dowel in a hand drill.

As the plug spun in the drill I applied it to the surface of a disk sander. Careful rotation of the drill rounded the plugs into perfect beads.

3 PIECE ASSEMBLY

1. Mount dispenser (holder)
2. Insert crank and roll shaft
3. Insert holding pin



DETAILED SUBASSEMBLY INSTRUCTIONS

Holder:

- cut side plates from 1" x 6" clear dry fir into 5½" diameter circles
- drill out centers 1¼" diameter circles for shaft assembly
- cut 2½" arc off each circle to flatten back edge for base plate attachment
- drill ¼" diameter holes through side plates at top and front ¼" from the outside edges for dowel support attachment
- cut 2½" x 6½" x ¾" base plate from the plate from ¾" stock
- cut ¼" dowels to 6½" lengths for dowel support
- drill pilot holes through back plate for screw/glue attachment of back plate to side plates (approx. ⅛" diameter for ¾" #8 flathd. wood screw attachment and ⅜" for heavier mounting screws of dispenser assembly to wall)
- apply glue & insert ¼" x 6½" support dowels between side plates
- glue back plate to flat spot on side plate edges and secure with ¾" #8 flathd. screws 2 each per side
- finish holder assembly as desired for matching your decor

Crank and roll assembly:

- cut 1¼" dowel to 6½" length for roll shaft
- cut ¼" x 5" x ¾" crank from hardwood scrap
- drill center of crank for ¾" #8 flathd. screw attachment of crank to shaft and secure with screw
- drill knobs and secure to crank at each end with 1" #8 flathd. wood screws

Holding pin assembly:

- cut 2½" length pin from ⅛" coat hangar wire
- glue wire ⅛" into wooden bead
- place crank and roll assembly into holder and drill ⅝" pilot hole in edge of holder 2 ⅜" deep penetrating roll ¼" to enable pin insertion

I drilled a hole in the edge of the reel handle side plate that penetrated ¼ inch into the tissue roll dowel. A wire pin from a coat hanger keeps the dowel from migrating out of the reel as the tissue roll is pulled. A wooden bead makes a handy grip for the pin.

The reel can be painted, oiled or varnished. Any good wood finish will suffice. The holder is mounted on the wall by a pair of screws through the back plate.

This is one of those projects that use up small pieces of stock that usually go into the wood stove. Any wood can be used but a nice piece of hardwood such as on the handle crank is very attractive.

It is a fixture that will be appreciated by anyone who loves to fish. My original was left with a fishing friend who admired it so much that I had to give it to him. I have made at least a dozen since then. Δ

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HOMEMADE

CANDY

My mom didn't like commercial candy. "Most of that store-bought candy is too expensive or tastes like chemicals," was her rather pointed opinion. Instead of buying store-bought she made a variety of simple homemade candies that she stored in three large hand blown glass jars. These jars sat on an old cherry wood drop leaf table in our living room. Most of my friends knew about these jars and had an unreserved love for them.

The thing I enjoyed most about these wonderful candies was that I got to help to make most of them. To me, they were more than just a sugary treat. When mom made candy, a carnival-like spirit prevailed in our house. It was her way of backing away from her busy work schedule to have some fun and to also spend some quality time with me.

A hundred years ago most candy was made at home. Making it was a simple process enjoyed by the entire family. Chocolate-covered fruits and nuts, caramels, fudge, penuche, pralines, peanut brittle, gum drops, candied fruit peel, and salt water taffy are only a few of a wide variety of candy delights that can still be made at home today.

I invite you to join me in three of my mom's favorite candy-making adventures. First I'll discuss a few candy-making basics, describing along the way the three basic confectionery candy groups: crystalline, noncrystalline, and gels and pastes. Once you understand the basics, you too will discover that home candy-making is easy, fun, and a great family activity.

My recipe review committee, consisting of my three children, Sarah, Jason and Michael, had a great time at these candy-making sessions. Not only did they help make the candy, they shared each variety with their friends and schoolmates, and they kept careful records of who liked what and who didn't. Sarah shared a batch of chocolate flavored southern pralines with the cast of her middle school play and became an instant star. Jason took two pounds of homemade peanut brittle to his soccer clinic a couple of weeks ago and teammates and coaches ate it so fast that



Richard Blunt

they forgot to give him a piece. He too became an instant star.

Most of the ingredients for making candy are shelf stable and are basic inventory items in a home storage food supply. Even less stable items, like cream and butter, can be substituted with reconstituted milk powder or vegetable shortening when necessary. These substitutions will produce finished candies that have only minor differences in taste and texture.

Candy basics

A simple definition of candy-making is the heating of a sugar solution, to cook off the liquid, until a desired degree of sugar concentration is achieved, then controlling how it is cooled back to room temperature. The exact way this is done varies according to the type of candy you're making and produces many of the different flavors and textures found in candies.

When making crystalline candies, such as fudge, pralines, penuche, and fondant, controlling the size of the sugar crystals while cooling the mixture is vital. A smooth and creamy texture is the bench-mark of a first class crystalline candy. Sugar crystals measuring only about .0005 inches are

required to produce this texture. Fudge and praline mixtures are complex crystalline candies because they contain milk solids and fat crystals as well as sugar crystals. The finished texture of these candies depends on how much water is left in the syrup after cooking, how the syrup is handled during the cooling process; and how uniformly the cooled syrup is beaten prior to its formation. Crystalline candies are cooked until the syrup is about an 85 percent sugar concentrate. This concentration is reached when the temperature on a candy thermometer reaches 235 to 240 degrees F, or soft ball stage. Fudge mixtures are cooled to about 110 degrees and beaten for an extended period with a wood spoon until they reach the right texture.

Praline mixtures are allowed to cool to about 150 degrees and beaten for a short period of time with a wooden spoon. The cooking, cooling, and beating, when properly completed, produce candies with a smooth, creamy texture. On the other hand, if the syrup is cooked too long and becomes too concentrated the resulting candy will be dry and crumbly. If the syrup is not cooked long enough it will not set and it remains runny.

Making crystalline candies on a rainy day or a day when the humidity is high is not a good idea because the syrup absorbs moisture from the atmosphere during cooling and the candy won't set properly. How crystalline candies are assembled prior to cooking, and treated immediately after cooking, also plays a vital role in the final texture of the product.

When sugar syrups are concentrated, they become saturated. This means that the solution contains as much dissolved sugar as it possibly can and if any more sugar is added it won't dissolve. This condition doesn't usually present a problem while the syrup is still hot because hot syrups tend to keep the extra molecules moving freely. But when the syrup starts to cool it becomes "supersaturated," that is, it is now holding too much sugar. If the solution is agitated during this cooling process, or an undissolved sugar crystal falls into the solution, a chain reaction could result in which the excess sugar molecules start attaching to one another, creating large ugly crystals which start to settle out. The result is candy that is grainy. Beating crystalline candies with a wooden spoon when the undisturbed syrup is cooled starts a controlled formation of very small crystals. The proper assembling, cooking, cooling, and beating of crystalline mixtures results in fudges, pralines, and fondants that are smooth, creamy, and delicious.

Home candy-makers also use ingredients such as corn syrup, cream of tartar, and glycerine to aid in the proper formation of sugar crystals. The candies can be made without such ingredients, but the results will suffer.

Noncrystalline candies, such as brittles, caramels, and taffy, contain about the same ingredients. Taffy and caramels have approximately the same moisture content as fudge and, similarly, are made with some butter and milk solids. But despite the similar moisture content, they are made noncrystalline by rapid cooling and the addition of larger amounts of a doctored sugar, such as corn syrup. These subtle, but significant, changes in formula and production procedure produce a candy very different from fudge. The rapid cooling and lack of beating produce a chewy solid made up of a random mixture of sugar and water molecules containing fat globules and milk particles. The distinctive flavor of caramels comes from the browning reactions of milk proteins and lactose and the caramelization of lactose. Caramelization is an extensive chemical reaction caused when any sugar is subjected to heat for a prolonged period causing its individual molecules to break apart. This reaction imparts a distinctive flavor to the candy. The flavor becomes progressively stronger as the syrup cooks.

Taffies are essentially caramels made from a more concentrated syrup, which gives them a firmer texture. Taffies are also "pulled" to incorporate air into the candy. This fun process gives taffies a chewy texture and light color.

Brittles are made by boiling the sugar syrup long enough so that the resulting candy will have only about a 1 to 2 percent moisture content. The syrup is then cooled rapidly, without beating, before sugar crystals have a chance to form. The prolonged cooking gives brittles a pronounced caramel flavor, a brittle texture, and a dark brown color. Baking soda is added to brittle syrup to somewhat neutralize the acid environment created by prolonged cooking. It also contributes to the flavor, as well as adding carbon dioxide which gives the candy a light crunchy texture.

Gels and pastes are the third major group of confectionery candies. They are made by mixing a sugar syrup with starch, gelatin, or a plant gum, such as pectin, and allowing the mixture to solidify into a compact, chewy jelly. Some favorites in this category are gum drops, jelly beans, and licorice. These candies have a finished moisture content of about 15 percent, achieved by cooking the syrup to soft ball stage—about 235 degrees.



Salt water taffy

My son, Michael, was the hit of his class on Valentine's Day when his classmates found out that the delicious, red, vanilla-flavored taffy he passed around was made with a little bit of love, and a lot of muscle work, in his own kitchen. When we visited my mother, one of Michael's favorite pastimes was digging the waxed paper wrapped pieces of salt water taffy out of the big glass jar that sat on the old drop leaf table. To make it easy for Michael to reach the candy, my mother would place her foot stool next to the table. Since his first visit with my mom, salt water taffy has been one of Michael's favorite candies and an easy choice of candy to share with his classmates, especially since he helped make it using Nanna V's recipe.

Ingredients:

shortening	2 cups granulated sugar
1 cup light corn syrup	1 Tbsp. corn starch
1¼ cups water	1 tsp. pure glycerin (optional)
1½ tsp. Kosher salt	2 Tbsp. butter
5 or 6 drops oil based flavoring (peppermint, rum, vanilla nut, etc.)	
Powdered food coloring, just enough to get the color you want (optional)	

Method:

1. Generously coat a large cookie sheet with shortening and set it aside.
2. In a stainless steel bowl combine the sugar, corn syrup, corn starch, water, glycerin, and salt and stir to mix. Carefully pour this mixture into a heavy-bottom 1½-quart sauce pan that has been coated with shortening. Try not to splash any of the mixture on the sides of the pan. Bring this mixture to a slow boil. Loosely cover the pan and let the mixture cook for 2 minutes.
3. Remove the cover, place the candy thermometer in the syrup so that the bulb is immersed completely but not touching the bottom of the pan. Continue to cook the mixture without stirring until the candy thermometer registers 260 degrees. Remove the pan from the heat and carefully stir the butter, flavoring, and coloring into the syrup.
4. Pour the taffy into the prepared cookie sheet and let it cool to the point that it can be easily handled. Turn the taffy with a greased spatula after 4 or 5 minutes. This will speed the cooling process. The taffy should be ready for pulling in about 15 minutes.
5. When the taffy is cool enough to handle, line up one or two helpers, have them coat their hands liberally with shortening and hand them each a ball of the cooled taffy. Instruct each helper to start pulling, folding, and twisting the taffy, in that order, until it turns a light creamy color and becomes difficult to pull.
6. Divide the taffy into four balls and pull or roll each ball into a strand about ½-inch thick. Cut the strands into pieces with scissors that have been coated with shortening. Wrap the pieces in squares of waxed paper and twist the ends of the papers. Put the candy in a jar.

Sugar syrup basics

For success with any candy it is essential that you know how to cook the basic syrup to the proper temperature and accurately determine when it is done. When cooking any sugar syrup it should boil at a moderate, steady rate over the entire surface. To achieve this you must know how to set your range burner to the proper temperature. You can teach yourself this by performing a simple exercise. In a heavy bottomed 1½-quart sauce pan combine two cups of granulated sugar and one cup of water. Gently stir the mixture to incorporate the sugar with the water. Place this mixture over medium heat, stirring constantly, until all of the sugar is dissolved and the mixture comes to a slow boil. Try to avoid splashing any of the syrup on the sides of the pan. Adjust the heat so that the syrup boils at a slow, steady rate. Clip your candy thermometer to the side of the pan, making sure

Salt water taffy got its name because it was apparently invented, in the 1880s, at a seaside resort in Atlantic City, New Jersey, as a confection to sell to tourists, and the name stuck. Contrary to what many believe, it contains no more salt than other candies and the salt it does contain is not sea salt.

that the bulb is immersed in the syrup but not touching the bottom.

While the syrup is cooking, fill a squat water glass with cold water. Keep an eye on the candy thermometer. When the temperature of the syrup reaches 235 degrees, remove some of the mixture with a teaspoon and drop it into the glass of cold water. Remove the cooled syrup with your fingers. It should form a ball when it hits the water. When you remove this ball from the water it should immediately flatten on your finger without pressure, but will not run off

Southern chocolate pralines

When my daughter, Sarah, discovered that my mom had a praline recipe, she insisted on making it and including it in this article.

"Why this recipe," I asked.

"Don't you remember the candy that Andy and his wife, Bunnie, gave me as a special treat when I was little."

"Not really," I replied.

She sighed, rolled her eyes, and smiled. After that routine, I usually do anything she asks. "Don't you remember how I used to stand on the stool at the kitchen window, in the afternoon, waiting for Andy to come home from work. When he arrived, I would run out the door to give him a hug, and he would pick me up."

That part of the story I do remember. The poor guy had no choice but to pick her up. It was impossible for him to walk with a 20-pound little girl wrapped around his leg.

My only comment was, "Why did Andy and Bunnie give you special candy? I never got any."

"Well dad, I don't think you were as cute as I was."

She took the pralines to her school play rehearsal, and once again, I didn't get any.

This recipe makes about 36 pralines. If for some reason you want more candy than this, make two separate batches. Don't attempt to increase the size of the recipe. Here is why: pralines are a close cousin to fudge, and require beating with a wooden spoon in order to form a proper crystalline structure. Like fudge, there is only a short window of time, after beating, before the candy sets up and becomes stiff. Unlike fudge, pralines are formed into individual candies, instead of a large sheet. If the batch is too large you won't have enough time to form all of the candies. Also, don't try to make this candy on a rainy day, or on any day that the humidity is high. If you do, you will run a high risk of the candies not setting up properly and remaining soft and runny.

Ingredients:

shortening	3 cups (about 7 ounces) pecan halves
2 cups light brown sugar, firmly packed	1 cup granulated sugar
1 cup light cream	3 Tbsp. unsalted butter
4 to 5 drops oil-based vanilla flavoring	1 oz. unsweetened baking chocolate, chopped or shredded

Method:

1. Line a large cookie sheet with wax paper and set it aside.
2. Spread the pecans in a single layer on another large cookie sheet and roast them in a pre-heated 325-degree oven for 10 minutes. Set the nuts aside.
3. Combine the sugars and light cream in a clean stainless steel bowl and stir until all of the ingredients are well mixed. Carefully pour this mixture into a heavy bottomed 2-quart sauce pan that has been liberally coated on the inside with shortening. Avoid splashing any of the mixture on the sides of the pan.
4. Place the pan over medium heat, and bring the mixture to a slow boil while stirring constantly to prevent scorching. When the mixture is boiling evenly and at a constant rate, clip the candy thermometer to the pan. Make sure that the bulb of the thermometer is completely immersed in the syrup without touching the bottom. Continue to cook the mixture over medium-low heat, stirring occasionally, until the thermometer registers 236 degrees.
5. Remove the pan from the heat, add the butter, vanilla flavor, and shredded chocolate without stirring. Allow the mixture to cool to 150 degrees.
- 6 Remove the candy thermometer and add the roasted pecan halves. Stir the mixture vigorously with a wooden spoon until it starts to thicken, but remains glossy.
7. Working quickly, drop individual candies onto the wax paper lined cookie sheet. Do this using two clean teaspoons, one to scoop the candy from the pot, and the other to push the candy onto the baking sheet. Let cool, then place in an airtight container.

Pralines will keep for several days when covered tightly and stored in a cool place.



Old-fashioned peanut brittle

I first made peanut brittle with my mom when I was 10-years-old. Ever since it has been my favorite candy. When made from scratch, the tender crunch and rich caramel nut flavor of this marvelous, easy to prepare candy has no equal. My son Jason and I had planned to make this candy together a few weeks ago. Unfortunately, the northeast got whacked with a late winter snowstorm and I had to go to work to handle an unexpected emergency. Jason was not happy.

My wife, Tricia, came to the rescue. "Give me the recipe, and I'll help him make it."

I asked her if she'd ever made it before.

"No, but if it's as easy as you say, I shouldn't have a problem."

Jason's sad face was instantly transformed to a happy smile. When I returned home, the peanut brittle was done.

Tricia's only comment was, "Cooking the syrup to such a high temperature takes a long time, but Jason and I still had a lot of fun talking about the various chemical reactions taking place as the syrup cooked."

Jason's indoor soccer team helped him test the quality of the candy. He passed the can of brittle around to all of his teammates. When the can got back to him, it was empty. Need I say more?

Tip: Do not use an aluminum pan with this recipe. Prolonged cooking of the syrup creates an acid environment in the syrup, a condition that can cause aluminum to corrode.

Ingredients:

shortening	1½ cups granulated sugar
½ cup light brown sugar	1 cup light corn syrup
½ cup water	1½ tsp. baking soda, sifted
¼ cup butter (do not substitute margarine)	
3 cups unsalted peanuts (raw nuts are suggested, but regular roasted peanuts will work, also)	
1/8 tsp. oil-based vanilla flavoring	

Method:

1. Coat two large baking sheets with shortening and set them aside.
2. In a clean stainless steel bowl combine the sugars, corn syrup, water, and butter. Stir until the sugars are incorporated with the water and corn syrup. Carefully pour the mixture into a 2-quart heavy-bottom stainless steel sauce pan. Place the pan over medium heat, clip the candy thermometer in place, and cook the syrup until the thermometer reads 275 degrees. Stir in the nuts.
3. Continue cooking over medium low heat, stirring occasionally, until the thermometer reads 295 degrees. Remove the pan from the heat. After removing the thermometer, add the vanilla, then quickly sprinkle the sifted baking soda over the mixture while stirring constantly.
4. Immediately pour the mixture onto the two baking sheets. When the candy is completely cooled, break it into pieces. Store tightly covered in a cool place.

your finger. This is called the soft ball stage. The syrup will remain in the soft ball stage until it reaches about 245 degrees. At 245 degrees remove the same amount as before, and drop it into a fresh glass of cold water. When the resulting ball is removed from the water, it will hold its shape for a few seconds, but will flatten as it reaches room temperature. This is called the firm ball stage. When the syrup reaches 250 degrees, or hard ball stage, the resulting ball will hold its shape when removed from the cold water, and resist flattening under pressure. At 270 degrees, the syrup will separate into hard but pliable threads when dropped into the cold water. This is called the soft crack stage. The final stage is the hard crack stage, and this occurs when the syrup reaches about 295 degrees. When dropped into the cold water, the syrup will separate into hard threads that

snap easily. At this stage almost all of the water has been cooked from the syrup. For most folks performing this exercise just once, successfully, is all the practice necessary.

The exercise will take about an hour and will teach you how sugar syrups perform at various temperatures. You will also get a good idea of how much time you have to set aside in the kitchen to properly perform this critical step in candy-making.

You have now moved from novice candy-maker to journeyman. After you have worked your way through Nanna V's three simple candy formulas, you will be a pro. Before we move on, I would like to share some advice on the subject of kitchen safety. Concentrated sugar syrups are extremely dangerous and viscous liquids when hot. If hot sugar syrup comes in contact with bare skin, it will stick

like glue and cause serious burns. Please watch yourself and your children when a sugar syrup is on the stove.

Special equipment

If making candy at home is a new interest, very little special equipment is required. If you find, after trying the simple recipes I have included here, that you enjoy candy-making, you can move on to making some of those classic candies that require more time commitment, knowledge, and special equipment. But to prepare my mom's three candy formulas the only special equipment you will need is a good candy thermometer that will clip to the syrup pan. The rest of the equipment is not special to most kitchens. You will need: one heavy-bottomed 1½-quart sauce pan, one heavy-bottomed 2-quart sauce pan, two standard size cookie sheets, and a heavy wooden spoon.

Special ingredients

In the beginning special ingredients are also kept to a minimum. To color and flavor candy, I use powdered or oil-

based food coloring and flavoring. Sugar syrups are carefully cooked to remove a specific amount of moisture. Standard food colors and flavorings, like the ones found in the supermarket, are water-based. Adding these water-based coloring and flavoring agents to a cooked syrup can significantly alter its water content. This can have a damaging effect on the finished candy. Oil-based or powdered flavorings and coloring agents can be purchased at most candy shops that sell candy-making equipment. If you can't find a candy shop that sells candy-making equipment in your part of the world, get on the Web and do a search titled, "candy-making." You can order them by mail. My mom used pure glycerin in her salt water taffy formula as an additional guard against crystallization and to help keep the taffy elastic. I have successfully made taffy with and without it, so I list it in the formula as an optional ingredient. You can buy pure glycerin at your local drug store.

Well, let's make these three candy recipes and put some of these basics to the test. Δ

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For summertime baking needs build yourself an outdoor horno

BY REV. J.D. HOOKER

My family has always been big on birthdays and holidays—including Thanksgiving, Christmas, Memorial Day, Fourth of July, New Years, and so on. Every holiday is a major event at our house and always includes plenty of good eating. Whether you're talking about birthday cakes, Thanksgiving turkey, a Christmas goose, or pies and cakes for July Fourth, there's more than the normal amount of baking going on around here.

For the winter time holidays that extra baking is a welcome aid for keeping the chill out of the house. But when the warm weather holidays show up, all that extra heat from the oven doesn't seem nearly as pleasant anymore.

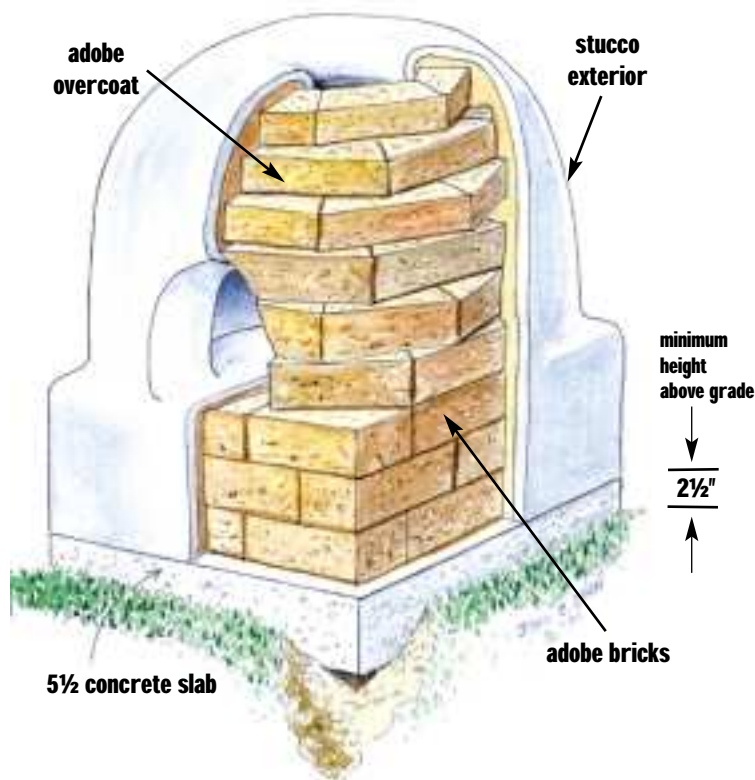
A few years back I walked into our kitchen to see how my wife and daughters were coming along with their preparations for the Fourth of July holiday. Though the outdoor temperature was up over 90°, stepping inside the kitchen was like walking into a solid wall of heat. I didn't think it could have been much hotter inside of the oven itself. I decided right then to do something about that.

Years earlier, I'd built a large outdoor fieldstone barbecue, so there already wasn't too much stovetop type cooking during the summer months. A space beside this barbecue seemed like the most logical location for an outdoor oven, and that's where I decided to build it.

Remembering the large outdoor adobe ovens I'd seen in use in northern Mexico and our southwestern states, I decided to build something similar for our use. But even though I know quite a bit about making adobe mud bricks, I really hadn't too much of an idea of how to go about building one of those clay ovens. Today, I'm still not sure I did everything (or even anything) correctly. But the adobe type oven I built does work, and it works very well.

I know that even in wet climates adobe buildings can last for centuries, if their base is kept dry, the roof is kept in repair, and they're kept painted to repel moisture. So the first thing I did was to shovel away the sod from the three-foot by three-foot area where I intended to build. Then I formed up the edges with 2x6s and mixed up my own concrete to pour sort of a floating slab base.

Next, I used some 1x4 lumber to fashion molds, as shown, for shaping the adobe bricks. Though I sized the molds to fashion bricks measuring 6-inches wide, 12-inches long,



and 4-inches thick, any size you deem appropriate for your own uses would work equally well.

Beneath the layer of topsoil, the underlying subsoil in our area is made up of heavy limestone clay which is ideal for fashioning adobe. In areas with other soil types, I'd recommend incorporating about 15 or 20% Portland cement into the mixture. I ran two bales of old straw through the shredder I'd fashioned from a power lawn mower (covered in Issue No. 44, Mar/Apr 1997) to mix in with the clay for making adobe.

In front of our house, my wife had already picked a spot where she intended to add a new flower bed. An awful lot of compost and such would need to be added here if she really wanted to grow much of anything, and the soil I removed I could use to make the adobe. So I shoveled away the sod and the thin (maybe 3 inches) layer of top soil from the 3-foot by 12-foot section she'd indicated, after which I ran our rototiller back and forth over the spot several times

until the underlying clay was very finely broken up. I then spread chopped straw over the area and used the tiller again to mix it in well.

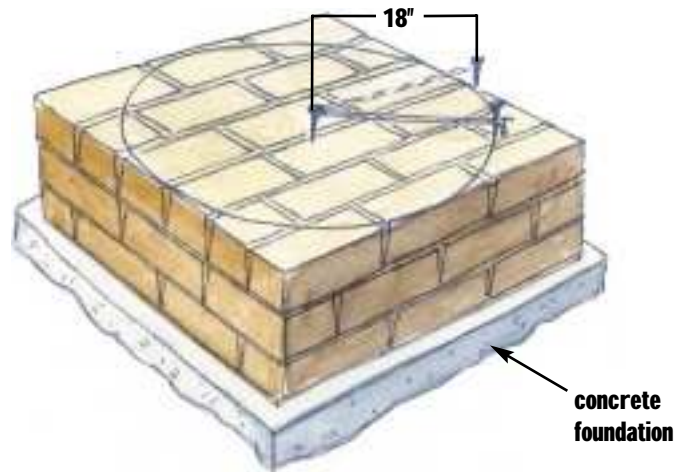
Now I used the garden hose to add water, while continuing to mix things together with the tiller, until the mixture reached a consistency that resembled "Play Dough." This damp adobe mixture was then shoveled into the molds, and the tops struck off evenly with a scrap of board. Afterwards the still soft bricks were very carefully removed from the molds and set in a sunny spot to dry out.

A week later, I covered the concrete pad with a triple layer of these dried adobe bricks. As shown in the illustration, a circle with an 18-inch radius was then scratched out on the top layer, with a 12-inch wide door opening also marked out. Following the scribed line, the first layer of adobe brick was laid in place. In the illustrations you can see how these bricks were trimmed to fit together (I used a worn out keyhole saw for this), Two more layers of adobe brick were set in place (as shown) in the same manner. I then used my hands to smear a layer of wet adobe over the entire inside of this lower portion to smooth the oven's interior nicely.

Now three more layers of adobe brick were added, one layer at a time with the inside portion of each brick carefully trimmed to shape, and with each layer tapering in towards the middle as shown. A smooth finish layer of wet adobe was smeared over the interior side of these layers as well. I then smeared a 1-inch thick layer of wet adobe as smoothly as I could over the outside of the oven as well.

For weatherproofing purposes, I then mixed up a sort of stucco at a ratio of one shovelful each of Portland cement and masonry cement to nine shovelfuls of sand. Using a regular concrete finishing trowel, I spread about a $\frac{3}{8}$ -inch thick coating of this cement mixture over the exterior of the whole thing, including the base. The next afternoon I brushed on a couple of coats of white house paint.

A couple of months later, I erected sort of a small roofed open air pavilion like structure over the entire oven-

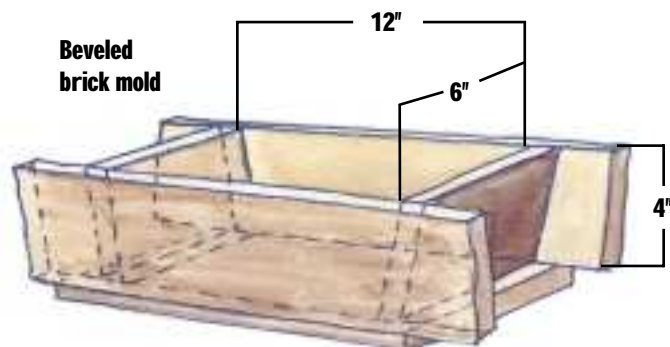
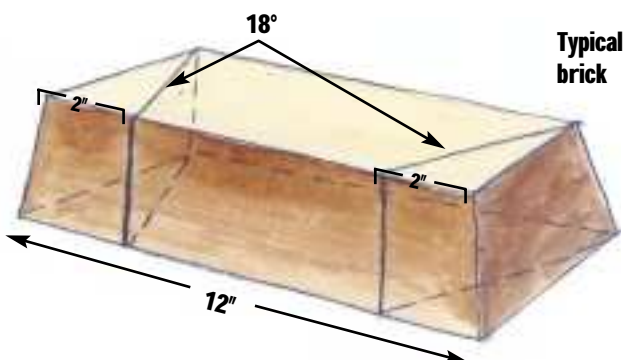


barbecue area. This was only partially for further weather protection. Mostly it was at my wife's insistence. She wanted to be certain that she could use her oven comfortably, even during inclement weather. I guess I must have done something right.

Though slightly different from using the gas or electric indoor ovens most of us have grown used to, baking in one of these adobe hornos couldn't get much simpler. Usually my wife and daughters will prepare everything they want to bake first thing in the morning then they fill the entire oven with dried corn cobs or chunks of wood, and light them.

Once the fire has burned itself all the way out, the ashes are carefully (it's **hot** inside the oven) swept out. A pair of adobe bricks are then used to cover the top opening, the food is placed inside, and the door is then blocked shut with a couple more adobe bricks.

It's mostly only the timing that takes a little getting used to. Each one of these clay ovens really is an individual creation and takes familiarity to use. This style of oven does hold in the heat for a long time, but each time you open it up to check on things, it cools a trifle quicker; and the



Cut bricks 2" from each edge toward opposite edge to bevel bricks for mounting in a circle for the 4th, 5th, and 6th layers. Increase the bevel progressively for the 7th, 8th, and 9th layers to dome the top of the stove.

Azore Island Easter Bread

Ingredients:

2 pkgs. active dry yeast	¼ cup warm water	1/3 cup warm milk
1 ¼ cups white sugar	6¾ cups sifted white flour	½ tsp. salt
1 cup melted butter	9 large eggs	

Mix together yeast, water, milk, sugar, and 1 cup flour and set aside in a warm place for 20 minutes or so. Add the salt, 3 more cups of the flour, butter, and eggs, and mix well. Keeping your hands well covered with flour, knead the remaining flour into the mix. This is a very sticky dough, so knead carefully. Place the dough inside of a well greased bowl, cover with a clean cloth and set aside in a warm place. Allow the dough to rise until doubled in size (about 1½ hours).

Punch the dough down and divide in half. Place each half in a greased 1½ quart baking dish or loaf pan, and cover with a clean cloth. Allow to rise until doubled in size again (usually less than an hour). Place the loaves inside of the oven and cover the door. These loaves are also done when nicely browned and hollow sounding when tapped with your fingers. Check them after 1 hour, and if not finished check every 15 minutes until done.

My wife and I like this one with a little butter melted on top, while our daughters prefer it topped with honey, and our grandkids actually like it best once it's become just a little dried out and they break it up into little pieces in a bowl, add milk, and eat it like breakfast cereal.

Traditional Adobe Oven Style Bread

Ingredients:

2 pkgs. active dry yeast	1¾ cups warm water
1 tsp. salt	3 Tbsp. white sugar
5¾ cups sifted white flour	4 Tbsp. melted butter or fat

Mix together the yeast, warm water, salt, sugar, and 1 cup of the flour; set aside in a warm place for 15-20 minutes. Stir in 2 more cups of flour and the melted shortening. Now stir in as much of the remaining flour as possible and then knead in the remainder. Continue kneading for an additional 5 minutes. Place the dough inside of a large well greased bowl and set aside in a warm place to rise, until doubled in size (about 1½ hours). Punch the dough down, divide in half, and place each half in a lightly greased bowl, cover with a clean cloth, and again set aside to rise until doubled in size (about ¾ hour). Carefully turn each loaf out onto a well greased baking sheet and brush the tops lightly with warm water. Close up the loaves inside the oven and check after 45 minutes. Loaves are well browned and sound hollow when tapped with your fingers when done. If baking isn't finished, recheck every 15 minutes until the loaves are done.

quicker it cools the longer the baking time. Once you've grown accustomed to your individual horno, however, you'll find that it actually doesn't seem much—if any—different from using a standard mass-produced appliance.

You know, aside from just your normal *BHM* reader's bent towards self sufficiency, constructing such a simple, yet enduring and reliable baking oven doesn't sound like such a bad idea for any of the folks worrying over this Y2K thing and other concerns either. Similar adobe ovens were used for at least a couple thousand years before gas or electric ovens were ever dreamed of, so you couldn't care less if the supplies of fuel or power are interrupted.

Be that as it may, should you decide on fashioning your own outdoor adobe horno, you might want to try the recipes I've included to help you become familiar with it. Both are

pretty forgiving about temperature and timing variations, so are especially easy for beginners.

The first recipe is one variety of the type of bread traditionally baked in the adobe ovens of our southwest. It's also one of our family's favorite wintertime breads and goes really well with stews, chowders, chilies, and similar one dish winter meals.

The second apparently originated in Portugal and was something that my mother learned to bake while my father was stationed in the Azores Islands for a short time during the Korean War. In the Azores this sweet bread is traditionally served during the Easter holidays, though in our family it's become something of a staple at every holiday gathering. Δ

THE IRREVERENT JOKE PAGE

(Believing it is important for people to be able to laugh at themselves, this is a new feature in *Backwoods Home Magazine*. We invite readers to submit any jokes you'd like to share to *BHM*, P.O. Box 712, Gold Beach, OR 97444. There is no payment for jokes used.)

In light of the rising frequency of human/grizzly bear confrontations, the Montana Department of Fish and Game is advising hikers, hunters, and fishermen to take extra precautions and be alert for bears while in the field. "We advise that outdoorsmen wear small bells on their clothing so as not to startle bears that aren't expecting them, and to carry pepper spray with them in case of an encounter."

It is also a good idea to watch out for fresh signs of bear activity. Outdoorsmen should recognize the difference between black bear and grizzly bear droppings. Black bear droppings are smaller and contain lots of berries and fur. Grizzly bear droppings have little bells in it and smell like pepper.

Submitted by Catherine Smith

POSSIBLE BUMPER STICKERS

Ax me about Ebonics

Honk if you've never seen an Uzi fired from a car window

**Did you know they took the word
gullible out of the dictionary?**

A young man was walking along the side of a road when he noticed a most unusual funeral procession approaching the nearby cemetery. A long black hearse was followed by another long black hearse about 50 feet back. Behind the second hearse was a solitary man walking a pit bull on a leash. Behind the man walking the pit bull were 200 men walking single file. The young man couldn't stand the curiosity. He approached the man walking the dog and said, respectfully, "Sir, I know it is a bad time to disturb you but I've never seen a funeral like this. Whose funeral is it?" The man replied, "Well, that first hearse is for my wife." The young man asked, "What happened to her?" The man replied, "My dog bit her and she died." The young man inquired further, "Well, who is in the second hearse?" The man answered, "My mother-in-law. She was trying to help my wife when the dog turned and bit her and she died." A poignant and thoughtful moment of silence passes between the two men and then the young man asked, "Sir, could I borrow that dog?" The man replied, "Get in line."

Submitted by John Allen

Don't be sexist - broads hate that

**If you lived in your car,
you'd be home by now.**

You're a feminist? Isn't that cute!

REASONS WHY IT IS GREAT TO BE A WOMAN

1. Free movies.
2. Free lunches.
3. Free dinners.
4. Free drinks.
5. You can cry without pretending there's something in your contact.
6. You actually get extra points for sitting on your butt and watching sports.
7. You don't have to fart to amuse yourself.
8. You and your friends don't have to get totally wasted in order to share your feelings.
9. You can sue for sexual harassment.
10. You never have to punch a hole through any thing with your fist.
11. You'll probably never see someone you know while peeing in an alley.
12. You can talk to people of the opposite sex without having to picture them naked.
13. You'll never have to blow 2 months salary on anything.
14. You can dress yourself.
15. When you take off your shoes, nobody passes out.

FLYING BLIND

(Submitted By John Allen)

One day at a busy airport, the passengers on a commercial airline are seated, waiting for the cockpit crew to show up so they can get underway. The pilot and the copilot finally appear in the rear of the plane and begin walking up to the cockpit through the center aisle. Both appear to be blind. The pilot is using a white cane, bumping into passengers left and right as he stumbles down the aisle, and the copilot is using a guide dog. Both have their eyes covered with huge sunglasses. At first the passengers do not react, thinking that it must be some sort of practical joke. However, after a few minutes, the engines start revving and the airplane starts moving down the runway.

The passengers look at each other with some uneasiness, whispering among themselves and looking at the stewardesses for reassurance. Then the plane starts accelerating rapidly and people begin panicking. Some passengers are praying, and as the plane gets closer to the end of the runway the voices are getting more and more hysterical. Finally, when the plane has less than 20 feet of runway left, there is a sudden change in the pitch of the shouts as everyone screams at once, and at the very last moment the airplane lifts off and is airborne.

Up in the cockpit, the copilot breathes a sigh of relief and turns to the pilot, "You know, one of these days the passengers aren't going to scream and we are going to get killed!"

As a senior citizen was driving down the freeway, his car phone rang. Answering, he heard his wife's voice urgently warning him, "Herman, I just heard on the news that there's a car going the wrong way on 280. Please be careful!"

"Hell," said Herman, "It's not just one car. It's hundreds on them!"

Family game: Tic Tac Toe, or as they call it in Ireland, circles and signatures.

QUOTES OF THE FAMOUS

Suppose you were an idiot..And suppose you were a member of Congress..But I repeat myself -- **Mark Twain**

I worry that the person who thought up Muzak may be thinking up something else. -- **Lily Tomlin**

Bigamy is having one wife too many. Monogamy is the same. -- **Oscar Wilde**

MEMORY LOSS

An elderly husband and wife noticed that they were beginning to forget many little things around the house. They were afraid that this could be dangerous, as one of them may accidentally forget to turn off the stove and thus cause a fire. So they decided to go see their physician to get some help. Their physician told them that many people their age find it useful to write themselves little notes as reminders. The elderly couple thought this sounded wonderful, and they left the doctor's office very pleased with the advice.

When they got home, the wife said, "Dear, will you please go into the kitchen and get me a dish of ice cream? And why don't you write that down so you don't forget?"

"Nonsense," said the husband, "I can remember a dish of ice cream!"

"Well," said the wife, "I'd also like some strawberries on it. You better write that down, because I know you will forget."

"Don't be silly," replied the husband. "A dish of ice cream and some strawberries. I can remember that!"

"OK, dear, but I'd like you to put some whipped cream on top. Now you'd really better write this down. You'll forget," said the wife.

"Come now, my memory's not all that bad," said the husband. "No problem—a dish of ice cream with strawberries and whipped cream."

With that the husband shut the kitchen door behind him. The wife could hear him getting out pots and pans, and making some noise inconsistent with preparing a dish of ice cream, strawberries, and whipped cream.

He emerged from the kitchen about 15 minutes later. Walking over to his wife, he presented her with a plate of bacon and eggs. The wife took one look at the plate, glanced up at her husband and said, "Hey, where's my toast?"

A man spoke frantically into the phone: "My wife is pregnant and contractions are only two minutes apart!" "Is this her first child?" the doctor asked. "No, you idiot!" the man shouted. "This is her husband!"

Fire investigators on Maui have determined the cause of a blaze that destroyed a \$127,000 home last month—a short in the homeowner's newly installed fire prevention alarm system. "This is even worse than last year," said the distraught homeowner, "when someone broke in and stole my new security system..."

AMBIDEXTROUS

chainsaw filing

By Thomas Brewer

I am not ambidextrous. My wife, Judith, uses chopsticks with either hand or even both hands at once. She is ambidextrous. I can barely write with my right hand, much less my left. Even so, I use this ambidextrous method of sharpening my chainsaw, and can sharpen the chain in 10 minutes or less without removing the chain from the saw, while using only a chainsaw file and a homemade stand.

Here are the secrets to sharpening a saw without weird filing jigs, fixtures, or other expensive and time consuming mechanical aids.

Basic principles

1. It is essential to look at what you are doing. You cannot, as I used to do, put the saw on the ground, kneel on the handle, and file away on the saw teeth and expect them to become sharp by the grace of a higher power. The homemade stand, shown in the illustrations, is designed to be used on a bench. It will place the saw chain where you can see what is happening to the teeth while you sharpen. The stand will also allow you to assume a comfortable position while you work on the saw. If you use reading glasses, put them on when you sharpen.

2. Orient the bar vertically. This is the most important purpose of the homemade stand. When the bar is vertical, gravity is your friend, and you can easily control the file position in the throat of the tooth. If you attempt

to file the chain with the bar in a horizontal position, gravity drags the file downward into the throat, and you will miss the cutting edge entirely. Orienting the bar vertically is so important that once you learn this technique, you will henceforth lean the saw vertically upwards against a tree if the saw needs an emergency sharpening in the woods where the stand is not available.

3. Adjust the chain tension prior to sharpening. This will pull the teeth into the bar and prevent them from flopping back and forth while you sharpen. This will make your filing faster and far more precise.

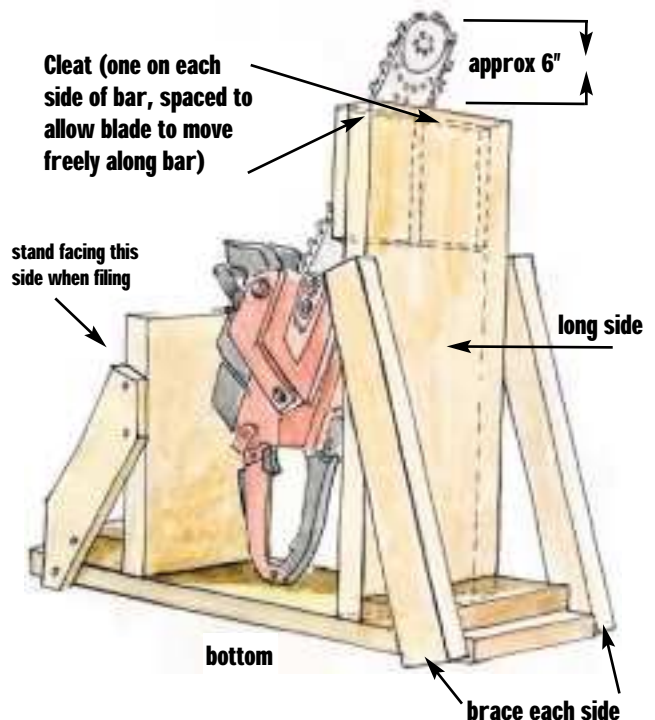
4. Wear gloves while sharpening. When sharpening, you will grab the bar with one hand to stabilize it, and your other hand, which is doing the filing, will frequently be driven into the chain. Gloves make sharpening a much more safe and comfortable enterprise.

5. Keep a block of carpenter's chalk in your chainsaw toolbox. When sharpening, use this to mark your starting point on the chain. It can be remarkably difficult to figure out when you have finished sharpening without this mark. You will also prob-

ably use the chalk to lay out cuts when you are using the saw.

6. When you begin to sharpen, allow the file to contact the tooth only in the forward (cutting) direction. Dragging the file back through the tooth will shorten file life considerably, will result in a poor tooth profile, and is at odds with the principle of watching what you are doing. After each tooth is finished, dust the filings out of the file teeth by brushing it across your pant leg. (I assume you are wearing work clothes if you are out there filing a chain saw). The file cuts more smoothly if it doesn't have to jump over filings that are stuck on the file surface.

7. Sharpen the saw frequently. Once every one or two tank fillings is about



right. If you sharpen at this interval, the saw will always be a pleasure to use and sharpening will go quickly. If you hit a rock, you might as well give it up and go sharpen the saw. A dull saw tends to wear the bar unevenly, so keeping the saw sharp will extend the bar life.

The homemade stand

The stand is nailed up from a few scraps of wood to loosely hold the saw in a vertical position. Make it of a size to hold your saw. The long vertical side should fall six inches or so below the top of the bar when the saw is placed in the stand. The two cleats on the long side of the stand that constrain the saw in the side to side direction are important. In order to position them, place the saw in the stand with the blade upright and mark the saw chain on either side where it contacts the long side of the stand. Leave a gap between the cleats that is wide enough to easily clear the saw teeth as you advance the chain to expose new teeth for sharpening.

Sharpening

Make sure that the saw's off-on switch is turned off. It isn't very likely that the saw could kick back while you are handling the chain, but I suppose it is possible. If the saw is electric, it should certainly be unplugged.

Place the stand on a bench that is at a height so that the teeth in the center of the bar are at about eye level. Different chains require different file diameters so be sure that you have the correct file. I probably don't need to mention that chain saw files are designed specifically for sharpening saw blades and are not the same as ordinary round files. For your first try, use a new file if you have one. This will show you how a good file should cut so that you will eventually know when to replace it. When the file is worn out, you can feel and also hear that it is not biting into the tooth mate-

rial, and it won't produce much in the way of filings.

Now to sharpen: Look at the saw teeth. You will notice, on newer chains, a diagonal line scribed across the rear part of the top outside surface of the tooth. The finished tooth profile as seen from the top of the tooth should be parallel to this line. If your saw chain does not have these scribed markings, you should draw lines across the back of the saw stand at the correct angle, and use these lines to guide your filing angle.

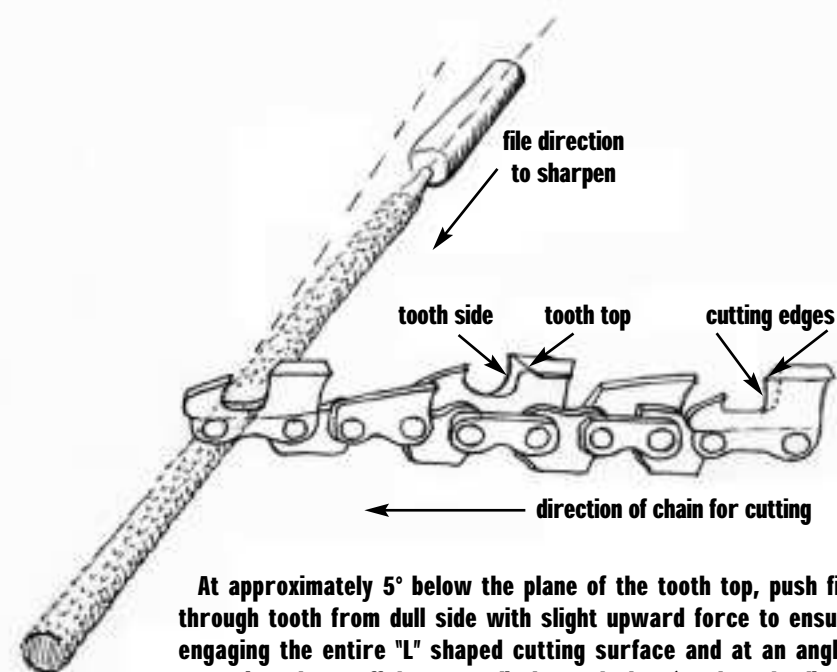
Stand in front of the short side of the stand so that you can see the teeth ascending on the top side of the bar. Pick a tooth that slopes upward to the left and mark it with chalk. You will sharpen this tooth first, and then sharpen all the similar teeth while advancing the chain through one full revolution. Then you will sharpen all the teeth with the opposite slope while advancing the chain through a second revolution.

Grasp the saw by the top of the bar with your left hand, and brace it firmly against the top of the stand and the

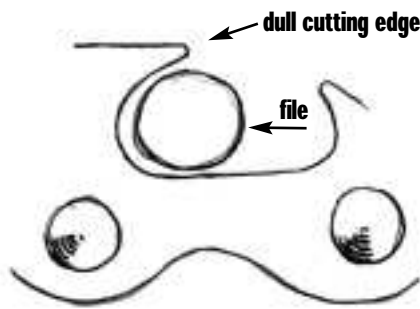
right hand cleat. With your right hand, sharpen the tooth that you previously marked.

Unless the blade is rock damaged, sharpening a chain in good condition should take about four file strokes per tooth. Take your first stroke and watch what happens to the cutting edge of the tooth. The file must travel in a straight line that is parallel to the scribed line on the tooth. You must also pull the file slightly toward the cutting edge (which is toward you) to assure that the cutting edge rather than the bottom of the tooth throat is filed. If things are going well, you will see a slight "wire edge" form on the cutting edge which is the last fragment of metal breaking off when the tooth becomes sharp. When the tooth is finished, the entire cutting edge will be straight, parallel to the scribed line, and sharp enough to peel a chip off the top of your fingernail.

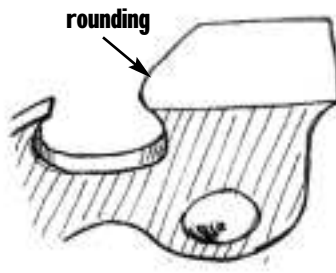
Now comes the ambidextrous part: When the left-upward sloping teeth are finished, it is time to repeat the process for the right-upward sloping teeth. The best way to do these



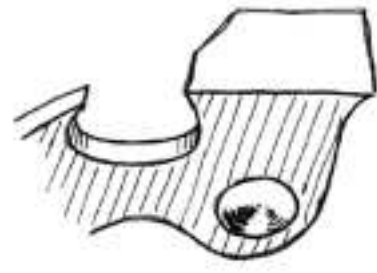
At approximately 5° below the plane of the tooth top, push file through tooth from dull side with slight upward force to ensure engaging the entire "L" shaped cutting surface and at an angle approximately 30° off the perpendicular to the bar (or along the direction of the scribed guide mark if provided).



A downward force on the file leaves cutting edge dull



Rocking the file up and down around 5° rounds the tooth edge



Below 5° the tooth is flattened

teeth is to merely switch hands. Grasp the top of the saw blade with your right hand, and file with the left. This allows you to remain in a position directly in front of the saw where you can see what is happening to the tooth. Although I am strongly right-handed, I found this very easy to do the first time that I tried it, and now, the left-handed teeth actually seem to go faster than the right-handed ones.

This is a fast process. If your chain has 40 teeth, and you use 4 file strokes per tooth, sharpening requires only 160 file strokes.

Problems

If filing does not make the cutting edge parallel to the scribed line, it means that the file is not parallel to the scribed line. If you are rocking the file up and down (vertically), the cutting edge will become rounded. If the file is tipped front-to-back, the cutting edge will not remain parallel to the scribed line even though the file appears to be at the proper angle. (See the illustrations.)

Attempt to file the same amount off of each tooth. Count the number of strokes that you use and file the same number on each tooth. After a number of sharpenings, some of the teeth may become noticeably shorter than the others. To fix this, try to use fewer file strokes on these teeth for several sharpenings until the others catch up. If you wish to really true up the blade, you should locate and sharpen the

smallest tooth, mark off its length on a scrap of wood, and use this as a gauge to file the remaining teeth.

If the saw has become rock damaged: Rock damage usually damages all the teeth on one side of the chain. Because of the way that I hold my saw when cutting near the ground, this usually seems to be the right handed teeth. The effect is usually to knock the point off all these teeth. To sharpen a rock damaged blade, I sharpen the blade using 10 or 12 file strokes per tooth, being especially careful to maintain the file alignment. This much filing may not completely restore the point on the tooth; however, the blade will usually cut reasonably well if the cutting edge is sharp. If the blade does not cut well, I sharpen it again and try it. I have never had to sharpen it more than twice. After a few more filings, the tooth point will be restored.

Rakers: Rakers are the projections that stick up between adjacent teeth to clear chips from the cut. Since the tops of the teeth slope backwards slightly, continued sharpening may drop the teeth so low that the blade rides on the rakers in the cut. This may prevent the teeth from biting even though they are perfectly sharp. If your saw chain has been filed a number of times and has reached a point where it just doesn't seem to cut well, the rakers may be at fault.

Blade manufacturers sell filing guides for raker filing to drop the rakers the correct distance below the

teeth. This is a simple metal channel that sits on top of the teeth. The raker to be filed protrudes through a hole in the channel, and it is filed with a flat file until it is flush with the top of the channel. I usually file the rakers three or four times during the life of the blade using one of these guides.

Do not over-do raker filing. If the rakers are too low, the saw "grabs," becomes difficult to control when starting a cut, and is much more prone to kick back—a definitely dangerous condition. If you file the rakers too low, it will probably take several teeth filings before the teeth are low enough to correct the condition. Some one who knows more about chain saws than I do has told me that he never files the rakers because of the kick back problem. He feels that a really sharp blade will work even if the rakers are too high.

Try this method. Especially try using the saw stand. You will find that you can sharpen your saw with great confidence when you can actually see what is happening to the teeth. Inspect your current blade. You may discover that the teeth are all sharpened at odd angles and have irregular lengths. You will be able to true them up very quickly using the saw stand and a fresh file.

One of these days I'm going to show Judith how to do this and then I will really have a sharp saw. Δ

Remembering what grandma used

By Marjorie Burris

My grandmother, Mary Etta Dillman Graham, was one of those frontier women who took life as it came; extremely practical, resourceful and inventive, she was always, always ready to help other women. True to her time and her own modest nature, she never spoke in mixed company about those things pertaining just to women, but she has been dead for over 47 years so she can't reprimand me now for telling publicly what I learned from her. I think. I hope.

Grandma was born April 3, 1860, just before the Civil War. She died February 13, 1952, almost 92 years old. She married my grandfather, John Graham, in December of 1881. They were married for 61 years.

For 30 years, from 1890 to 1920, she served as the only midwife to the women of rural Clay County, in Southern Illinois, up until her brother's son, Howard Dillman, her nephew and my second cousin, graduated from medical school and came home to be the beloved country doctor. Even then, for the first five years of his practice, Cousin Howard asked Grandma to accompany him on his home deliveries, to teach him, to teach the new mothers, and to be her usual comfort to all. Howard later said Grandma taught him more about "birthin' babies" and the care of new mothers than he ever learned in medical school. In fact, she was his inspiration to become a doctor. And out of the 11 girl cousins in the family, four became registered nurses, me included. We all say we wanted to become nurses because of grandma's example.

In the days before disposable sanitary napkins, grandma made what she called "personal pads" out of old, soft, all-cotton material—sheets, towels, well used baby diapers—anything that could be spared. She never used new material; she was too thrifty for that. The pads were about 4 inches wide, 12 inches long, and had 10 or 12 layers stitched together. They had long cotton tails sewn on each end. The tails were drawn up and looped and either pinned or tied over a soft belt worn around the waist. And they were **not** thrown away after use. They and baby diapers, which were not disposable, either, were treated alike.

Immediately after use, they were rinsed in clean water, wrung out by hand, then put in a pail with more clean water and left to soak overnight. The next day, they were scrubbed



on a scrub board in hot soapy water and rinsed well in more clean water. Then they were dumped into the oval-shaped copper wash boiler set on the old black wood-burning cook stove and boiled for one hour—no less time; occasionally they were stirred with the "dipping stick" which had previously been a broom stick. After boiling, they were dipped out, rinsed again in cool, clean water and wrung out as dry as can be done by hand.

Then in the summertime they were hung out on the clothes line to dry in a sunny spot. In the winter they were hung on a clothesline strung permanently behind that cook stove. Whether outside or inside, they were discretely covered by a baby diaper or a bath towel. Grandma didn't want some loud, shrill, childish voice asking, "What do you use those funny looking things for?"

When times were hard, and they usually were back then in rural Illinois, many new mothers simply did not have many linens to spare for personal pads so grandma would make a pad shell instead of using several thicknesses of material. She would stuff the shell with soft, dried grass or large, dried leaves.

One time when she and I were pulling a row of new carrots in the garden, I saw her look thoughtfully at the lacy tops as she slid them through her fingers. That evening I noticed bundles of carrot tops drying on that ever present clothesline behind the cook stove, and the next day she used those tops to stuff some new pads she was making. After use, the stuffing

was pulled out, dried, and burned and the shell was washed and boiled as usual.

Grandma never had a course in microbiology, but she knew that boiling and burning were inexpensive ways to kill most disease-causing germs.

She was very proud of the fact that none of the babies she cared for had diaper rash, and the new mothers did not become infected if they followed her instructions. And it was hard work to keep clean in those days. Most farms in the late 1890s and the early 1900s had no electricity; water had to be pulled up from a well with a bucket, carried into the house, and heated on a wood-burning cook stove.

After use, it had to be carried back outside and dumped far from the house. Water is heavy and it took a lot of it. Grandma never permitted her patients to use hard work as an excuse for not keeping clean. She did not say that cleanliness was next to godliness, but she did stress that cleanliness was essential for wellness and well-being.

Grandmother could not even imagine some of the modern equipment used in today's hospitals for delivering babies, but 100 years ago she could turn an ordinary farm kitchen into a more than adequate delivery room. Some of her "old-timey" adaptations were so sensible that they could still be practical in a home delivery today. I think I can share some of her ideas best by telling about the first time Howard and I worked together in the delivery room.

In the summer of 1952, I came home fresh from nurse's training to work in the small hospital the county had completed only the year before. By this time most of the women of the area were coming to the hospital to have their babies. Grandma had passed away that spring, but Howard was still in practice and he was the attending doctor for the majority of the deliveries.

One night, in preparation for an upcoming delivery, as was the custom, I started wiping down all the delivery room furniture with a disinfectant solution. Howard stuck his head in the delivery room door to let me know he was there, and I heard him gasp. Turning, I saw him staring at me with tears in his eye, "Oh, Marjorie, you look so much like your grandmother used to, I'll probably reminisce all night long about our early days delivering babies together. Do you mind?" Mind? I was delighted. His comparison that night between the then and the now have stayed with me all these years.

Grandma always prepared the farm kitchen for a delivery much like I was doing now. She wiped the kitchen table and all the furniture with clean, soapy water, and directed the rest of the farm family to wash all the dishes and scrub the floor. Everything that was not to be used in the delivery was to be put away or taken out of the room. I put the obstetric instruments in the autoclave; she put them in the copper wash boiler on the cook stove and boiled them. I poured sterile water into a sterile basin for cooling the instruments. She had boiled a large pot of water and set it off the stove to cool so it would be ready to cool the instruments. I handed Howard a

sterile paper gown. She had first put her own home made oil-cloth apron around Howard's neck, then covered that with a big-bibbed cloth apron that had been washed, boiled, ironed, wrapped in a sheet, and baked in the oven. I draped the delivery room table with sterile paper sheets. She covered the kitchen table with a clean oil-cloth, then spread the sheet she had baked the apron in over the table. I scooted a rolling stool over by the delivery table for Howard to sit on. If the family had one, she brought in the piano stool from the parlor. Otherwise, she placed a kitchen chair nearby the table. I put the little baby clothes in a warmer in the instrument room off the delivery room; she put them in the warmer on top of the cook stove.

When our patient was wheeled into the delivery room, she looked at Howard and me and smiled, "The nurse told me you cousins were working together for the first time tonight. Did you know that I was one of the last babies Mrs. Graham delivered before Dr. Dillman came to town?" We didn't.

Howard and I saluted one another across the room. We had a legacy to keep that night. Everything went well. We delivered a sweet little boy. And, yes, we both felt grandma's presence through it all. Δ

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James O. Yeager photo

Growing the **ETERNAL TOMATO**

By Leonard Trebor

It's an old story to longtime gardeners (and a new story to novices): each spring you buy some superb tomato plants, set them out on May 1 (or thereabouts), then you mulch, water, and spray until about July 4 (depending upon the part of the country in which you live) when you pick your first real beauties of the season.

The plants then thrive for the remainder of the summer. But, about the end of August, they begin to wilt and die. The event is always marked with a tinge of nostalgia as you wonder if you will ever see such wonderful tomatoes again.

Of course, there is always next season, but you can never be sure if the new plants will come close to equalling the old ones. The new strains may not

be to your liking, or there may be a problem with the plant's ability to resist wilt or cold weather. You wish you could keep the old plants forever.

Actually, there is an easy way to keep your tomato plants alive forever. You can grow and enjoy the Eternal Tomato by investing just a few minutes and spending a few extra cents. In the bargain you will have the earliest and best plants in your area the next season.

Suckering

Many old-time gardeners know about the process called suckering. This calls for you to break a stem or two from your tomato plants and plant them. Don't worry about your plants because breaking off the suckers doesn't hurt them. In fact, they'll grow a lot better without them.

Here's how to do it: Examine your healthy and strong plants. Look for

stems and limbs that look like the forks of a slingshot. The only difference is that growing from the exact center of the fork there will be a shoot, called a sucker, that looks healthy and vigorous—and it is because it is using more than its rightful share of the nutrients of the plant. Break off the sucker by holding it one inch from the point where it joins the fork of the plant. Bend it forward, then backward. The stem will snap off cleanly, unlike other stems of the plant which will snap and then cling by a few fibers if you attempt to break them away.

The suckers you break off should be no more than one foot in length. When you have the sucker in hand, push the stem end into a jiffy pot or some other small container that's filled with potting soil. Push the end three or so inches into the soil and use your fingers to pack soil tightly around the stem.



1. Locate the suckers that grow on a straight stem from between two strong tomato branches. **2.** Grasp the sucker near its base, about an inch from where the three growths come together. Just snap the sucker loose. **3.** Stick the broken end of the stem into the potting soil and pack the soil tightly around the stem.

Do eight or ten of the suckers if you have room for them. Water them generously, but do not have the stems standing in water. Set the containers in an old tray or inside an aluminum pan. Leave them where they will get abundant sunshine.

Within five or so days, the stems will put out roots and, in a few weeks, you will have an independent plant that is ready to produce tomatoes.

When is the proper time to start sucker plants? You can do it whenever you wish, as long as the parent plant is good and strong.

When you start your tomato plants in the early summer or late spring, you can set out a dozen or so plants. Then two or three weeks later you can break off a dozen or two suckers from the 12 plants.

Set these new plants out and, in two to four weeks, you can break suckers off these plants, as well as from the first sucker plants and the parent plants. In short, start with 10 or 12 plants and by mid-summer you will have a hundred plants, all the children of the parent plants, coming at no cost whatever, except for the potting soil.

And you don't even need potting soil. It simply helps get the plants off to a good start. However, if you wish, you can break off the suckers and stick the stems directly into good, loose soil and

they will take root there if you see they are watered well.

During the summer you can eat the fresh tomatoes and sell, barter, or can the surplus. In our family of three, we like to have two quarts of canned tomatoes per week, so we can about 100 quarts each year. This gives us plenty of base for spaghetti sauce, soups, and other dishes.

At the end of the season you can pick all the green tomatoes, wrap them individually in newspaper, and, in the middle of winter when you unwrap them, they will be a delightful shade of ripeness.

At the end of the season, snap off more suckers and start these in small containers. If you build a small greenhouse, you can keep the plants through the winter.

As the tomatoes grow larger and larger, you can transplant them to larger containers. You may want to use five-gallon or smaller containers. One-gallon cans also work well.

The greenhouse will keep the plants alive on cold nights, and if you open the doors on warm days the wind or the insects still on the wing will pollinate the blossoms, and you can grow

your own fresh tomatoes even when there is snow on the ground.

The following spring, move the plants back outdoors and, if you wish, you can transplant them again, this time into the soil of the garden. Then the process starts all over again. Δ



SEX and sins in the cemetery

By John Silveira

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Ayoob on Firearms:

Rifles, shotguns, and handguns for Y2K and beyond

You bought it for a worst case scenario. If that doesn't come to pass, you'll still own it. I'm talking about rifles, shotguns, and handguns that'll get you through bad times and good.

What happens in the event that Y2K comes and goes and society doesn't fall on its face, even if it stumbles a bit. Are you going to feel as stupid as people did in the Fifties and Sixties with fallout shelters they never needed? People get antsy about preparing for something that might never come.

Realistic preparations

Consider this approach: Prepare yourself with things you can use if society doesn't break down.

Experienced rural people have known for a very long time that having a generator just makes good sense. I'd be surprised if there's a hospital in the land that isn't outfitted with generators in case the power goes out for some reason besides a computer bug shutting down a too "techno-dependent" society. Even if society doesn't break down, the water system might, and what does stored tap-water cost you, anyway? Societal collapse notwithstanding, if you have room to store it, isn't it just practical to buy staple foods, toilet paper, sanitary napkins, et al in bulk and stockpile them, saving money compared to the usual urban "wait 'til we run out and then buy as needed" paradigm?

So it is with the guns. Let's look at some rifles that would be awfully good to have on hand if the doomsayers of Y2K turn out to be right...and

would be good to have on hand anyway.

.308 rifles

Springfield M1A. As currently produced, this is a splendidly-made example of the M-14 rifle, a design that goes back roughly half a century and is essentially an improved WW II M-1 Garand. With up to 20-round magazines still readily and legally available, it fires the 7.62mm NATO/.308 Winchester cartridge. Ammo is abundant. The rifle is utterly reliable.

The M-14 was constructed for a projected battlefield in which it was thought that the hedgerow fighting and house to house combat of the European Theater would be the small arms battle plan of the future. This is remarkably close to defending a home against armed invaders on foot or in



Massad Ayoob

cars and trucks in a "post-Armageddon" scenario.

No Armageddon? No problem! A five-round magazine makes this accurate, reliable autoloader an excellent hunting rifle in rugged country. More than a decade ago, in Namibia, I used a sniper grade M1A Springfield to shoot a springbok at 350 yards. The local rules said "no semiautomatics," so I used the gun without a magazine as a single shot with just the one round in the chamber. Ben Mozrall,



This 7.62 NATO HK91 has served the author for 20 years without malfunction.



An Olympic Arms match-grade ultra-lite AR-15 upper mated with a Colt lower and fitted with C-More electronic dot sight. It's great for recreational shooting and formidable for home defense. It weighs less than 6.5 lb and belongs to Ayoob's youngest daughter, Justine Lauren.

then head of the New Hampshire State Police SWAT team, shot a 1.5-inch group with this same rifle at 200 yards. In a weak moment, I sold it with its exquisite Leupold scope to John Groom. Later I came to my senses and bought a stainless Match Grade Springfield Armory M1A to replace it. Target shooters, be advised that this is the rifle that kicks butt in national class High Power competition. The prices are excellent these days. An added feel-good bonus: no American gun manufacturer has been more vocal about individual citizens' Second Amendment rights than Springfield Armory.

Other fine .308 "battle rifles" include the European **FN SLR** and **HK91**. In the score of years I've owned it, I can proudly say my Heckler and Koch HK91 has never malfunctioned.

.223 rifles

With ammo readily available, the 5.56mm NATO/.223 Remington round will get you through the darkest of human conflict nights. It's the choice of not only the entire US mili-

tary, but most of the cops. If I was going into battle, I'd want the superb ergonomics (speed reloading, ambidextrous use around cover in any configuration, fine balance) of the **AR-15**. For my own needs, the short, handy, super accurate **Steyr AUG** is a personal favorite, but I bought mine back when the price was reasonable. For a "best buy" today that's still user-friendly, you can't beat the **Ruger Mini-14**, which, in stainless steel, is the mainstay of this magazine's publisher, Dave Duffy, and it's senior editor, John Silveira.

No end of the world? No sweat! The .223 is still ideal for "back porch to garden and beyond" sniping of local animals who figured you planted your garden for them instead of you. With light, high velocity hollowpoints, such a rifle is still a devastating manstopper for home defense, offering light recoil with high hit potential on multiple targets at close range under stress in short time frames. And .223s are always fun for recreational plinking, which is what my youngest has used hers for (**Olympic Arms AR-15** with C-More red dot electronic sight) since she was twelve.

7.62 X 39 auto rifles

This ComBloc cartridge, Kalashnikov's updating of the first (German, WW II) assault rifles, approaches the classic American .30/30 hunting round in effectiveness when used with a soft-point hunting bullet. There are essentially three popular choices. A semiautomatic version of Kalashnikov's own **AK-47** will indeed work through mud or blood or crap or flood, but it won't be terribly accurate. Good for close fighting, not great for recreational use at significant distance. Ruger's Mini-14 in this caliber is known as the **Mini-30**, and with hunting-legal five-round magazines standard (and longer magazines available "aftermarket") makes more sense as "Y2K insurance for now, and a lightweight, light-kicking deer rifle for later." Finally, there's my own choice in this caliber, the **SKS**. This old ComBloc beast is at least twice as accurate as the AK-47, rivaling the Mini and the AR. It's as ruggedly reliable as the AK, generally has a better trigger, and 10 shots instead of a bigger magazine is its only shortcoming. They're cheaper than dirt, as gun prices go, even now. I prefer the well-made commercial Norinco guns from China, and the Russian Paratrooper versions, because they both have short stocks that work well for petite females, or for adult men in heavy cold-weather coats. The same softnose hunting ammo you'd use in a Mini-30 can make the SKS a useful "farm gun" once any perceived societal crisis has passed.

I don't care for AK rifles much. Factory magazines of 20- and 30-round capacity for the Mini-30 are limited to cops under current law. For an ordinary law-abiding citizen getting started, I'm not sure you can beat the cost effectiveness of the SKS. I won one in a match, gave it to my oldest kid, and then bought an identical SKS for my youngest. In the best of all worlds, I'll have died of old age and each of my daughters will have an

SKS, ammo, and accessories secured safely in their homes for their kids, far in the future.

.22 rifles

Survivalist guru Mel Tappan said you should have it. Gun experts say you should have it to teach marksmanship to your kids and other new shooters. Fast and in-the-eye-socket accurate, the gun we're talking about is a top-quality autoloading .22 rifle. The ammo is cheap, and so light it's portable. A box of 50 rounds of .22 Long Rifle is the size of a small survival ration of wooden matches.

For accuracy, reliability, and cost effectiveness, you can't beat the time-proven **Ruger 10/22**. I hate to sound like a PR man for Ruger, but that's just how it is. There are more aftermarket accessories (folding stocks, match-grade barrels, extended quick-change magazines, etc) available for the 10/22 than for any other .22 rifle. A close second on my list would be the **Marlin Model 77**. Over a million of these neat little rifles have been made. They're accurate, they're reliable, and the only reason I don't rate them over the Ruger is that you can't readily get extended quick-change magazines for all of them. (Most Marlins have tubular magazines, which are comparatively slow to reload.)

I enjoyed my 10/22s and my Marlin 77 before anyone heard of Y2K. I'll enjoy them once it's over. When that's all history, an accurate .22 caliber semiautomatic rifle will still pick the squirrels off your bird-feeder, still zap the woodchuck in your backyard garden from your kitchen window, and still put a 50-grain bullet through the rapist's eye and into his brain as he breaks through the bedroom door.

Other rifles

"Other rifles" is a world to cover, and I want to keep this short. Sure, a lever action .30/30 will get you through the night, but it's slow to reload in an emergency involving high-volume shooting. Yeah, the Lee Enfield .303 Jungle Carbine was the best bolt-action battle rifle of its time and not a bad deer rifle even today. Yes, the Steyr-Mannlicher rendition of Jeff Cooper's Scout Rifle is superbly crafted. Liked mine, sold it anyway. These are bolt-action rifles. When you show me how I can get off five shots in one second with a bolt gun at "down the hall distance" like I can with a semiautomatic, enlighten me, OK? Until then, a gun that would do to protect one's innocent family against many-to-one lethal odds needs to be semiautomatic as far as I'm concerned, and for purposes of this article, the topic is worst case scenario

family defense guns that can be useful later. If the emphasis seems to be on later, I apologize, but we can't ignore realistically-perceived short term needs now.

Shotguns

The shotgun is a versatile firearm. But is it the ideal defense gun for a worst case Y2K scenario...or even for the best of times?

Los Angeles cops used to call it "the tube." Westerners called it "the scattergun." A whole lot of folks have called it the single most versatile of all hand-held firearms, and within its limitations, they may be right.

The "shotgun" is so named because when you drop its hammer on the ammo it was primarily designed for, it expels a cloud of pellets known as "shot." There is birdshot, a great number of tiny pellets, suitable for killing light-bodied creatures like the fowl of the air. There is buckshot, fewer pellets but each larger and heavier, which at close range act like so many old-fashioned, non-expanding pistol bullets striking all at once. These are designed to kill deer at short ranges, and other animals in the 130 to 300 pound range, animals like...oh, Hell, you figure it out. Finally, there are shotgun slugs, which turn what was once known as a "fowling piece" into .70-plus caliber rapid firing heavy rifles in close quarters.

You use fine birdshot to shoot "upland birds." You shoot heavier, coarser birdshot for "waterfowl," ducks and geese that you'll have to shoot at longer range through heavier feathers and body mass if they are to come down from their migration routes to grace your table. Buckshot ("double-ought," as it's known historically) sends nine .33 caliber pellets from the muzzle of a 12-gauge shotgun at once. It's roughly the same as shooting something nine times in the same millisecond with a .32 caliber automatic pistol and old-fashioned ammunition. Cops use it when they



Two of the best defensive shotguns available today. Top, Remington 870 pump; bottom, Mossberg 9200A1 auto. Folding stocks shown are handy but not essential.

anticipate close-range gunfights, and African hunters used 00 Buck when going in close on wounded lions and leopards in the thickets. Finally, the 12-gauge rifled slug—an ounce of lead almost $\frac{3}{4}$ -inch in diameter, flying at 1100 to 1600 feet per second—is not only the close range “shotgun deer load of choice,” but is what some professional hunters in Alaska and elsewhere resort to when they have to go into the underbrush after wounded grizzly bears. It is also the ammunition the NYPD Stakeout Squad switched to after a few shootings where even the deadly “double-ought buckshot” didn’t put their armed opponents down fast enough.

Good news with shotguns

Obviously, the shotgun is versatile. So are its design options. You can get a single barrel (too slow for anything more serious than sport, but cheap). You can get a double barrel, anywhere from \$200 for a second-hand Stevens 311 that will get you through the night, to six figures (yes, you read it right, over \$100,000) for a super-grade shotgun custom made in Europe. Or, you can get a functional pump-action shotgun (Mossberg or Remington Express) for around \$300 or less. A semiautomatic shotgun will start a bit higher than a pump.

Bad news with shotguns

When the strength is versatility, the weakness will generally be found in specialty. The history of the human experience seems to be that whatever works half-ass well for everything will be found specifically deficient in something. So it is with shotguns.

So, what we’re talking about here are shotguns that might be bought by someone anticipating a worst-case scenario after a Y2K or similar societal breakdown. One study of LAPD

use of (12-gauge pump) shotguns in actual gunfights indicated a 58% hit potential. That means out of every two shots fired in anger, slightly more than one was likely to put one or more 00 buckshot pellets into the opponent. If we translate that to a multiple-opponent gunfight scenario, it tells us right up front that a one-or two- or even three-shot gun will give us a limited future against multiple opponents.

This tells us that for defensive purposes, we need a baseline of a “magazine-fed shotgun,” which will hold an absolute minimum of four shotgun shells in its reservoir, and if time allows the defender to load the gun all the way up, with one more shell in the firing chamber, a minimum of five shells capacity. **Important note:** There is **no** magazine-fed shotgun made today to this writer’s knowledge which incorporates a firing pin safety. This means that **any** shotgun kept for emergency defense purposes needs to be stored with its firing chamber empty, so that it cannot accidentally discharge if dropped or struck on either end.

What not to look for

Don’t tell me that your shotgun is cool for every distance because it has interchangeable chokes. You won’t have time to change the chokes in the moment it takes you to transition from your first opponent at your doorway to the one 40 yards away in the parking lot who is aiming his stolen rifle at you.

Don’t tell me that your shotgun is emergency versatile as opposed to situationally versatile because it can shoot birdshot, and buckshot, and slugs and all the rest. The versatility requires time for you to load the right shells into the magazine! That time may present itself to a police SWAT team that has the suspect in the crosshairs of multiple gunsights. It won’t be there when you have to quickly change gears between perpetrator A on the front doorstep and per-

petrator B, also armed with a rifle, way out there at the barn.

Don’t tell me you load your shotgun with birdshot for home defense because, “It will blow away a bad guy, but it won’t shoot through the walls and hurt the kids.” A whole bunch of us have put our fists through the kind of sheetrock walls that separate our bedrooms, but none of us was ever able to put our fists through the opponents we punched in the stomach, as hard as we tried. If it will go into your opponent enough to blow away his internal organs, it will go through the wall and endanger your children too. If it won’t go through the sheetrock your fist can go through, don’t count on it to keep a homicidal antagonist you hit dead-center with it from killing your babies.

I’m sorry if that takes away something you were counting on, but somebody had to tell you in time.

Recommended shotguns

Your defensive shotgun should be a pump action or a semiautomatic. For professionals who keeps their guns clean—and know how to break them down to do that—I strongly recommend the semiautomatic. For people who tend to neglect their equipment, I would most strongly recommend the pump gun.

There are damn few semiautomatic shotguns that will cycle 100% with light loads, medium loads, full power loads, and Magnum loads, no matter what you may have read in gun magazines. I have been to “gun writer seminars” where the hosting gun companies fed us up to the gills with shrimp and booze and paid for our nice hotel rooms, and some of my colleagues wrote great things about the guns that malfunctioned when we all tested them. I wrote the truth. That’s why I’m not invited to some of those seminars anymore, but my duty is to you, not to the gunmakers.



Mel Tappan's "survivalist's choice" pistol, a Colt .45 automatic, remains a very sound alternative, especially for those trained in its use. It's a potent manstopper even with the round-nose "GI ball" ammo shown.

When in doubt, buy a **Remington Model 870 Express** or a **Mossberg 590** pump gun as first choice, a **Mossberg Model 500** as close second choice. If you want a 12-gauge autoloader, buy a **Remington Model 11-87** or a **Benelli Super-90** or a **Mossberg Jungle Gun**. I say this not as the gunwriter who supped at the tables of the manufacturers—actually, I am that, I'm just not speaking as such.

I speak now as the full-time firearms instructor who sees what works and what doesn't, 20 to 40 students per combat shotgun training session who hose buckets of buckshot downrange at high speed and find weak points in their guns that people who shoot light trap and skeet loads never discover.

Any of the above-recommended guns will serve you well in an emergency. In the lighter-kicking 20 gauge, spewing 20 .25 caliber buckshot pellets per pull of the trigger, I'd recommend the **Remington semiautomatic Model 1100**, especially the light-weight LT-20 model with short stock that fits smaller people better and causes no shortcomings to those with taller stature or longer arms.

When Y2K is history, I hope we'll all feel embarrassed by having stockpiled guns and all the rest as a statement of our distrust of our fellow man. When that happy "nothing happened" ending comes to pass, the shotguns discussed above will still be worthwhile tools for home defense, bird-shooting for the table, and other tasks that accrue at the "backwoods home."

Handguns

Let's look at handguns for Y2K and beyond. A single gun has to be multi-purpose:

- Accurate enough to kill an animal some distance away for food.
- Powerful enough to stop a threat coming in on you quickly.
- Holding enough ammunition to allow you to shoot fast and straight and, if necessary, reload quickly and shoot fast and straight some more.
- And, when you don't worry about "Y2K panic in the streets" any longer, a gun that will still serve you well for recreational shooting, home and personal defense, and for the chores that

firearms have historically performed at rural homesteads.

Single action frontier style revolvers and single shot pistols and derringers are out. Not enough firepower.

.22s have a place in a survival kit for shooting small game for subsistence, and the ammo is certainly cheap and easy to carry in volume. You have to determine what you're most likely to need to shoot. .22s are cool for squirrels. In the anti-personnel function, however, they have proven effective for only two classes of people: highly trained Israeli intelligence operatives and Mafia assassins. Both seem to have the knack of getting behind the opponent and shooting him through the base of the skull. If this doesn't seem a likely scenario for your needs, then as useful as a low-powered .22 handgun is around the rural home, you can do better for an all-around handgun whose purposes include emergency defense.

.38 Special/.357 magnum revolvers

The .38 revolver won't take the longer, more powerful Magnum cartridge of the same diameter, but a .357 Magnum revolver will fire shorter .38 Special cartridges. Unless there's a compellingly necessary cost saving, in guns of the same size buy the .357 and you'll have a better chance of resupply if the future is such that ammo becomes scarce. The small ones shoot only five rounds, a few of the new bigger models hold seven or eight, but for the most part a .38 or .357 revolver will be a six-shooter. Have some speedloaders handy, of the proper size for that particular revolver, and you can learn to quickly reload six shots at once in less than six seconds.

These guns are sturdy and reliable. If all the gunsmiths were going to disappear, I'd choose the built-to-last-forever **Ruger**. The **Colt**, **Smith & Wesson**, and **Taurus** brands are all good choices, too.

.45 semiautomatic

Survivalist guru Mel Tappan recommended this gun, specifically the **Colt Government Model** or one of the other 1911A1 variations, as that pistol was known when it served the US military for most of this century. All good-quality .45 ammo is powerful enough to trust in a fight, though the hollowpoints work a lot better and are less likely to shoot through the bad guy and hit a good guy. Many of our readers were trained on this gun in their military past. The gun you are most trained with is the one you'll fight best with, and when you are judged later for your actions, being trained with the gun you used is a plus. This is an advantage for the service revolver mentioned above if you were trained with one in a former life as a cop or security professional.

If you like the .45's power but don't like the necessary "cocked and locked" carry mode for the 1911 gun, you can get any of several modern double action .45 automatics. These require a long, heavy, intentional pull of the trigger to fire. **S&W**, **SIG**, and **Ruger** are all good. I'll be wearing a Ruger .45 automatic, issued by my police department, at the moment the 20th Century turns into the 21st, and I'll be comfortable with it. These guns have worked great for us. The **Glock** is another very reliable modern .45 automatic. In fact, it's been my experience that the .45 caliber versions are the most accurate pistols Glock makes.

9mm semiautomatic

Tappan didn't like this caliber, but that's because in his time most of the 9mm ammo available was impotent in terms of quickly stopping aggressive threats. Things are different today. You can get loads like the Triton Hi-Vel I carry in my own 9mms. A standard 115 grain hollowpoint will leave a 9mm's muzzle at 1100-something feet per second. The Illinois State

Police "hot load" (so hot they won't sell it to the general public) sends the same bullet out of their **Smith & Wesson 9mm** autos at 1300 feet per second. The Triton Hi-Vel is rated at 1325 feet per second from short barrel pistols, and I recently chronographed it at more than 1450 feet per second out of the almost 5-inch barrel of one of my Berettas. This is ".357 Magnum country" in terms of potency. A pistol with 16 rounds of this 9mm, weighing the same as an eight-shot .45, is no contest for me: I'd go with the hot-loaded 9mm every time. (If you can't find Triton locally, we stock it at my place. Call toll-free (800) 624-9049 for catalog and ordering info. You'll need to mail or fax an ID card proving that you're at least 21.)

Alas, the 9mm choice presumes always being able to get the best ammo. A 9mm is very "cartridge dependent:" standard full metal jacket ("ball") ammo in that caliber is impotent for fighting determined opponents. If you may have to get ammo "where-ever," go .45. If you have enough ammo stockpiled for your needs, hot 9mm has an edge.

Many readers have been trained with the Beretta M9, known in commercial circles as the **Beretta Model 92**, which the US military adopted over a decade ago. Again, the gun you're trained and proven with is the gun to have. I know one guy who taught at Fort Benning whose "Y2K preparedness kit" includes two Beretta 9mms, one for each hip, in the same kind of holsters whose use he taught to soldiers.

The Beretta is a fine 9mm fighting pistol, but the **Glock**, the **SIG**, the **Smith & Wesson**, the old **Browning** and many others would also deliver noble service. With 9mm, remember, the trick is having enough of the right ammo on hand.

Points to consider. You'll hear or read people saying that you should have the Beretta 9mm because you can interchange ammo and magazines with military personnel. The same

argument used to come forth for having the 1911 .45. Excuse me, but I think someone has seen one too many reruns of "Night of the Living Dead." If you really think cops and soldiers are going to share their ammo with private citizens they don't know during a crisis, I would like to talk to you about buying some oceanfront property in Kansas City. The Beretta 9mm and Colt .45 are fine guns, but buy them for good reasons, not stupid ones. The same is true insofar as the thought that you should have a .38 or .357 like the cops had before, or a .40 caliber pistol like so many cops have now. The police aren't likely to share with you either.

Training

Don't just buy the handgun, train with it! The handgun is the most difficult of firearms to learn to shoot quickly and accurately. Scumbag criminals in gunfights (as opposed to murderers standing on top of their helpless victims) only hit the good guys they shoot at with 15% of their shots or less. Cops minimally trained in marksmanship will go 17% to 35% in hit potential. The cops on well-trained departments—a skill level I truly believe you can reach in home study—will go to 40% or better hit ratio per shot in real-world gunfights. The highly trained SWAT officers and graduates of private academies approach or exceed 80% hit potential with handguns in actual shootouts.

So get training and practice. Δ

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Salvaging CEMENT BLOCKS

the easy way

BY BILL LEONARD

There are millions of dollars worth of old concrete blocks all over the country, and they are ready for the garbage dump. You can get these blocks, hundreds of them at a whack, at a terrific price—in many cases free by merely salvaging them.

Next time you see an old shell of a building that has been burned or which has collapsed because of rot or storm damage, ask the owner what he will pay you to clear away the cement block walls so that the land can be used for something positive instead of serving as a home for vermin.

Odds are the owner will not fall for this line, but if he does, you have a super stack of building blocks at no cost, and you'll get paid to salvage them. Otherwise, he will probably accept an offer to let you clear away the shell in exchange for the blocks.

Remember, however: many building codes do not permit you to use used blocks as load-bearing walls in a residence. But you can in all likelihood use them in storage or outbuildings, tool sheds, and the like.

We built a tractor shed and a host of other outbuildings from used blocks, and we have been totally satisfied with them.

Here's how to salvage building blocks. Start at the top, unless there are extenuating circumstances. Begin by clearing away all the debris around the walls, then set up a ladder or scaffold alongside the wall.

If the wall is already broken, you can start in the center of the broken area. If the wall is solid, you will have to break the first block in order to get a work space cleared.

Don't worry about the first block. Use a heavy hammer and tap gently until the block either breaks into pieces or the mortar joints break. In the second event, you can save the block. You can also save most of the



1. When you start in the middle of a course, you can try to use the crowbar as shown above to break the blocks loose. Depending upon the kind of mortar used, you may be successful immediately. 2. Often the blocks will separate under gentle but increasingly firm pressure. When this happens, you can simply lift the blocks out as the mortar joints are broken. 3. Apply pressure at all points. In this course we went to the course below and started to break mortar and bed joints.

remaining blocks, although you can expect one or two to break in the salvaging process.

There are three or four basic ways to remove the blocks without breaking them. Try a chisel and crowbar first. Place the point of the chisel under one corner of the block and strike the end of the chisel with a hammer. Wear safety glasses, because the mortar dust and chips will fly in all directions. Wear gloves, too, as the mortar chips can cut your fingers or hands.

When you have chipped out a small opening, insert the point of a crowbar and pry by pushing down on the other end. Depending on how the mortar was mixed, the block will usually pop loose quickly and easily. Continue this process along the entire top course of the wall.

When you free a block, take care how you throw it to the ground. The blocks have great compression strength, but they are extremely fragile and will break if you drop them from a height onto a hard surface, such as well-packed soil.

You can also attack from the side of the blocks by using the hammer and chisel on the mortar joint that forms the "bed" or the bottom of the block. If there is a great deal of sand or lime in the mortar, the bond often breaks easily.

You can also use the end of a timber, such as a 4-x-4, as a sort of battering ram. Instead of battering the block, however, you thump it gently but solidly until the bond breaks.

Yet another way is to stand so that you can bend over the center of the wall, so that you can see straight down into it. The ribs of the block are not aligned, so there will be a bonding effect. Rest the fulcrum part of the crowbar on the rib nearest the block to be removed. Then push down on the curved end of the crowbar until the point of the other end presses against the end of the block to be removed.

Apply gentle pressure downward until the mortar joints break. A little

more pressure and the blocks pop loose.

Working in the manner listed above, you can take down an entire wall of a basement or house within a day or so. Keep in mind that you can salvage at least 30 blocks in an hour. If you had to pay \$2 or more each for the blocks, you can see how much you are actually earning for your work.

When you get the blocks home, it's time to start the cleaning process. This can be a very difficult or very easy job, depending upon the type of mortar used.

Try the easy way first. Use a chisel or the blade of an old and essentially worthless screwdriver. Place the point against the place where the mortar joins the block. Your best bet is a place where the mortar joint has cracked and broken. Tap the screwdriver or chisel gently and the mortar will often pop loose cleanly.

If the mortar is particularly stubborn, use a rock hammer on it. If you don't have a rock hammer, borrow or buy one. As much as you are saving on the blocks, you can afford the hammer.

Use the point to chop away at the mortar. Sometimes you will succeed only in pulverizing the mortar, but that's fine. All you are interested in is getting the mortar off the blocks.

The work can be discouragingly slow, but remember that you need not remove every vestige of mortar. Keep at it and, when you are finished, you will have a treasury of building materials that cost you nothing. Δ

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Parge the **UGLY** out of your CONCRETE WALL

BY BILL LEONARD

You can say a great deal in favor of cement block (or, if you prefer, concrete block) building. It's fairly fast, reasonably easy, particularly in small projects, and incredibly cheap if you are willing to scrounge a little and salvage the block.

But one thing you can't say about the traditional concrete blocks is that they are pretty. In fact, cement blocks,

unless you buy some of the decorative ones or paint the regular ones, can be, and often are, as ugly as a mud fence.

But, some of you are asking, what on earth is parging. Or you may prefer the "pargeting" spelling. It doesn't matter whether you pronounce it par-jay or parj. But for those of you who do not know, parging is simply the act of mixing a batch of mortar, then applying it to a wall of some sort. In this article that wall is the foundation

of a house, but you can do it for anything else you want covered.

You may also think of parging as applying a form of stucco to a wall. In fact, stucco, by definition in the modern sense, is mixing portland cement, lime, and water and applying it onto a wall for decorative purposes. In another context stucco is a fine plaster used to cover a wall.

What we are talking about here is covering ugly cement blocks so



1. Use a gloved hand to push the sand around the screen until the fine particles fall through the mesh and the larger particles are left on the screen. Discard the large particles. **2.** Use a trowel to smear the parget material over the surface of the dampened cement blocks. Lap over the final part of the wet mortar each time you apply another trowel-ful of mortar. **3.** Use a wet trowel to smooth the still damp surface. The thinner the mortar, the easier it is to get a smooth surface. You will be amazed at the difference that parging makes on the surface of the blocks and on the general appearance of the house.

they will have a more aesthetically pleasing look.

Here's a simple way to mix the plaster or stucco. Start with an 80-pound bag of portland cement, 70 pounds of masonry sand, an appropriate amount of water, and ambition. Now here's how you can cut your expenses slightly. Instead of buying the masonry sand, you can use sand dug from a creek bed or from alongside a country road.

Now you are ready to sift the sand, which should be dry when you start. We use an old screen that is fit for nothing else. We place the screen over a mortar pan (you can also use a wheelbarrow, plywood box, or whatever else will hold the mixture). Pour a small amount (10 pounds or so) onto the screen, then shake the screen gently back and forth until all the fine sand is sifted into the mortar box. You can also use your hand (if you wear gloves you save wear and tear on your flesh) and rub the sand back and forth until only the coarser materials are left. When you have a 70-pound batch of sifted sand, you are ready to dump in half a bag of the portland cement.

Rest assured that there is no magic in getting the weights or volumes down to the grain or the macro-ounce. If you are close, it will work pretty well. Mix by using a garden hoe and shovel, if you need one, until the sand and cement are well mixed.

Now add water. Start with a small amount and rake the mixture back and forth until the water is absorbed. Add more and more water and keep mixing until the mixture will absorb no more liquid. The final consistency should be such that if you turn the hoe blade to a diagonal position and pull it through the mixture, the cement should barely hold its form. In fact, you may want to add water (for the final work, at least) until the consistency is even more liquid.

To apply the mixture, you will need a hose with a nozzle on it (or you can use a small container for the purpose—this to be explained shortly)

and a trowel or two. If you will be covering huge spaces, you will cover more wall faster with a huge trowel. If you plan to do small and close work, where neatness is the most important consideration, use a small trowel.

When the mixture is ready, lay down some drop cloths (or, as we did, some old cardboard boxes laid edge to edge and pushed up against the wall). If you are working in an area where neatness is not a consideration, such as the wall of the underground part of a foundation wall where back-filling will occur later, you need not be too concerned about some dropped mortar.

When you are ready, spray a mist of water (or use a small bucket and splash water on the area to be parged) so that you have a small amount of dampness on the wall. Why? The explanation that is usually offered is that mortar forms a bond as moisture inside the blocks is pulled out as the moisture from the mortar is also pulled inward. If there is no moisture in the blocks, all the moisture from the mortar will be sucked into the blocks, leaving the mortar dry and crumbly before it can set fully.

Start at one corner or other boundary or limit of the wall. Be sure to wet the trowel before you start, just as you wet the mortar pan, the hoe, and the shovel before you begin the mixing. Hold the trowel upside down, scoop it into the mortar, and "load up" the backside of the trowel. Hold the trowel low, if you are starting at the bottom, and smear the mortar upward and finish the arc in front of your body and at a point two to three feet higher than the point where you started.

The next arc should overlap the previous, so there are no places left uncovered. As you apply the mortar, press inward with gentle pressure to force the mortar into the pores of the blocks.

If you did not sift your sand well (and some of the sand you buy at hardware stores has not been sifted properly) you will feel small pieces of

gravel rolling under the trowel, and you can see the path of the gravel because it leaves a small path through the mortar—an unsightly trail, at that.

If you are applying a scratch coat, you need not worry about keeping the surface smooth. If, however, the first coat is also the last coat, you will want a smooth surface. To achieve this smooth appearance, apply a thicker coat of mortar, then apply a thinner coat on top of the first application. You can even omit the second coat and simply dip your trowel into a bucket of water then smooth the parged surface with the dripping trowel.

Around windows, doors, and other interruptions in the wall line you need to use either a small trowel or great care and a steady hand. Mortar smears on unwanted surfaces should be cleaned before the mortar dries.

When you remove the drop cloth (or cardboard boxes) you will need to fill in the tiny spaces where the floor protector met the wall. For best results, work in small sections, wetting the smaller area then covering it before moving to another area and repeating the process.

Don't let the outside or fringe area of the first section dry before you lap it with fresh mortar. When you must stop for the night or for long periods of time, try to complete work to a corner or other wall interruption.

It is good to work under cloudy weather on hot days. If the temperature is extremely high, stop and spray or mist the covering of the wall periodically to prevent too-fast drying.

When you have finished work, or when you plan to stop for more than a half hour or so, rinse the shovel, trowel, and hoe to clean away all mortar. Clean the mortar box at the end of the day.

Be sure to take a picture of the area before and after the parget work. You'll be amazed at the appearance of the work area. Δ

Growing GOLDENSEAL

It's like having your own backwoods gold mine!

By Rev. J.D. Hooker

After some serious reflecting on recent market prices, and taking into consideration the most profitable types of marketable plants, along with suitability to our area and soil and the amount of labor involved, my wife and I decided to take up growing goldenseal as one of our primary cash crops. Back in 1900, a \$10,000 per acre, per year profit was possible growing this crop. Today, goldenseal root has been selling pretty steadily at around \$30 per pound for sometime, which isn't drastically different than the price offered for cultivated ginseng. The herb portion, which can be pretty abundant, has been selling for around \$3 a pound.

We decided to start with a half acre. I hope you'll bear in mind that raising goldenseal (or ginseng, or any other high-dollar herb crop) is not any sort of super-easy get-rich-quick scheme. But neither is it as complicated or difficult as many folks imagine. Once all of the initial start up work and expenses are out of the way, raising goldenseal represents nothing more than a relatively labor intensive, but very high profit, cash crop.

While growing requirements for goldenseal are pretty close to those of ginseng, goldenseal is a much more "forgiving" crop in many ways. It can stand up to, and improve with, moder-

ate fertilizer use (especially well rotted manure), where ginseng loses value when fertilized. We also considered the fact that the goldenseal herb (the above ground portion of the plant) can be harvested and sold every year, while the roots are still growing in both size and value. With ginseng, you're looking at a single harvest of roots once every three years or so.

A native of the deep woods, goldenseal's growing requirements are fairly strict. That is where all of your initial investments, and serious labor come into play. This crop requires well-drained, soft, friable soil of moderate fertility and medium pH. The soil needs to be kept fairly damp, but never soggy. Fairly dense shade is also needed for these plants to grow, as prolonged exposure to direct sunlight scorches and kills the plants quickly. They don't compete well with weeds or other plants, either.

With all of these requirements in mind, we decided that we'd probably do best by striving to mimic the methods used by the high-volume, high-profit commercial growers.

The first order of business was to build up some well-closed-in and well-drained raised beds. A good friend of mine owns a fiberglass fabricating and repair business down in Ft. Wayne. From him we obtained a free supply of used fiberglass bucket-truck booms, which were used to enclose the sides of the raised beds. Logs, lumber, rocks, cinderblocks, stacked pieces of broken concrete, and many other materials would have worked just as well, but we couldn't beat the price.



Next, we used a rototiller to mix large quantities of shredded leaves, rotted sawdust, composted grass clippings, and modest amounts of manure into the soil. We buried a section of perforated black plastic drain tile about a foot deep, right down the center of each raised bed, to ensure excellent drainage. We ordered a supply of goldenseal rootlets from Dalton Rorer for planting stock, then started putting up our shade structures. We kept re-rototilling these beds once a week to kill off any weeds that germinated prior to our planting.

While many sorts of naturally rot resistant wood (catalpa, osage, cedar) would have worked as well, we found slightly warped pressure treated landscaping timbers very inexpensively on sale at the nearby lumber yard. We used these as the uprights. We set one end of each timber into a posthole dug about two feet deep into the ground, then firmly packed the soil back into place around it.

Our next step was to enclose the east, west, and south sides, as well as the roof of the structure with some sort of shade-producing material. In many areas of Wisconsin it's common to see "Sang Sheds" with coverings fashioned of spaced plaster lathes, snow fencing, or thin saplings in a modified corn-crib manner. In our area, though, there is a hardwood sawmill with plenty of leftover "slabwood," and a hardwood molding manufacturer with large quantities of long strips of hardwood scrap, both of which are available free for the loading and hauling. Several pickup loads of this free "waste" material proved ideal for our purposes.

We used galvanized 7d nails to attach these strips, leaving about a one-inch space between them, which resulted in a nicely shaded interior.

Since we'd decided to begin initially by preparing half an acre, it could have been easy for us to have invested a few thousand dollars in these preparations. Instead, by utilizing so many readily available free materials, we cut

our out-of-pocket expenses by about 98%.

Once the goldenseal rootlets arrived, we packed them in dampened sand for 24 hours before planting. We planted them with the tops about an inch below the surface of the soil, spaced six inches apart, in rows eight inches apart. Most came up nicely within three weeks of planting. They may even give us a harvestable herb crop this year. With a mid-June planting date, that seems pretty good to me. After that, we can expect to harvest the herb portion of these plants near the end of the next two or three growing seasons, while at the same time providing ourselves with some seed for more plantings.

During the next years, new plants will keep popping up by themselves as the root network spreads out, until each shed is completely covered with bedding goldenseal. In the fall, once the growing season is over and the tops have died back, we will carefully dig up the roots with a spading fork. Then, after a careful washing, they'll be well dried in a shaded spot and prepared for shipment to the buyers.

At present, our plans are to plant an equally sized area each of the next three years. Hopefully, some will be with self-provided seed. We should be assured of having both a very valuable root crop and a reasonably profitable herb crop to market each year.

Even more so than with a vegetable garden, weed control—both through hand cultivation and through the use of rotted sawdust, shredded leaves, and other mulches—is a high priority with this crop, as is the occasional and judicious application of a fungicide when required. We've been using Daconil by Ortho. The damp and dark growing conditions that goldenseal requires naturally creates fungus problems. The over application of fungicide can create problems of its own, though, so use some caution and moderation here. Δ

RESOURCES

The following is a list of some of the markets and suppliers who I've found to be most helpful:

SEEDS AND/OR ROOTLETS FOR SALE:

Hsu's Ginseng Enterprises, P.O. Box 509, Wausau, WI 54402

Shumacher Enterprises, 1006 Hickory Street, Marathon, WI 54448
Ginseng, Flag Pond, TN 37657

The Homestead, 72799 Old 21, Kimbolton, OH 43749

Roots "O" Gold, Box 92, Le Center, MN 56057

White Crane Trading, 426 First Street, Jersey City, NJ 07302

Dalton Rorer, 6850 Hwy. 593, Calhoun, KY 42327

Heartland Herbs, 113 Whiteside, Columbia, IL 62236

Ankur Enterprises, 221 N. 152nd Ave, Marathon, WI 54448

HERB AND ROOT MARKETS:

Sharp's Roots and Herbs, 1409 Frank Phillips Blvd, Bartlesville, OK 74003

Hsu's Ginseng Enterprises (above)
Wilcox Natural Products, P.O. Box 391, Boone, NC 28607

Buncan's Fur, Hide and Root Company, 3080 Ramp Creek Rd, Bloomington, IN 47401

Culp's Root and Fur Company, 210 Hubbard, Great Bend, KS 67530

Dave Hicks, P.O. Box 90 Granville, NY 12832

Madison's, Box 116, 660 Water Street, Canneaut Lake, PA 16316

Roots "O" Gold (above)

White Crane Trading, 426 First Street, Jersey City, NJ 07302

Brake's Roots and Herbs, P.O.Box 443, Erin, TN 37061

Gruver's Trading Post, Rd#2 Box 218, Mayport, PA 16240

Lam Pun Partnership, 2906 St. Lawrence Ave, Reading, PA 19606